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# AVIATION WEEK

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## AVIATION CALENDAR

Sept. 25-26-27—Michigan Engineers Society of Michigan Engineers, Stoltz Hotel, Battle Creek, Mich.

Sept. 25—26-27 at Wayne State Engineers, Veterinarians and Opticians Forum, sponsored by the Michigan Academy of Science, 5414 Woodward, Hotel Detroit, Mich.

Sept. 26—27-28—Michigan Engineers Engineers jointly sponsored by University of Michigan Transportation Institute, Western Michigan University and The Association of Michigan Engineers, Michigan State, 2828 North Zeeb, Regional Council of Engineers, Civil and Public Works Bureau, Kansas City, Kan.

Sept. 30-Oct. 4—National Associates Meeting, American Production Forum & American Engineering Displays Society of America, Hotel Sherman, Hotel Sherman, Los Angeles.

Sept. 30-Oct. 1—International Conference on ocean and earth surface programs for the International Geophysical Year, International Arctic Bureau of the International Union of Geological Sciences, 2121 Grant Avenue, N.W., Washington, D.C.

Oct. 2-6—National Airport Conference, University of Oklahoma, Norman, Okla.

Oct. 2-4—4th Annual National Meeting and Exposition, National Society of Professional Engineers, Consultant Hotel, Denver, Colo.

Oct. 4-6—Fifth Annual Lands Banquet, Society of Experimental Test Aeronautics, Beverly Hills, Los Angeles.

Oct. 6-10—International Petroleum Aviation Conference, Hotel Edgewater, Petrolia, Petrolia, Edgewater, Alberta, Canada.

Oct. 7-9-10—Annual National Electrical Conference, Hotel Sherman, Chicago, Ill.

Oct. 7-9—Fourth Annual Laboratories Conference, sponsored by American Society of Lubrication Engineers and the American Society of Mechanical Engineers, Royal York Hotel, Toronto, Canada.

Oct. 7-10—Forsman Inspection, Lincoln Field Inspection Laboratories, Cleveland, Ohio.

Oct. 7-12—Annual Meeting, American Bar Association, Hotel Statler, Boston, Mass.

(Continued on page 60)

АУДИОФОРУМЫ & МЕССЕНДЖЕРЫ



and the other is a small, thin, dark, irregularly shaped mass, which is the nucleus of the cell.

Information: Please read from [Solid Ice Activities](#) Web page.

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Burlington, Massachusetts

## AVIATION CALENDAR

(Continued from page 4)

June 8-9—For details write TAE, 35 Lowell Rd., Concord, Mass.  
6th Bi-Annual Aircraft Development Conference, Hotel Americana, Chappaqua Hotel, Scarsdale, N. Y.

Oct. 9-11—National Fall Convocation, Society for Experimental Stress Analysis, El Cajon Hotel, San Diego, Calif.

Oct. 10-12—National News Management Symposium, Statler Hotel, Chicago, Ill.

Oct. 16-18—Concurrent with the 1967 Annual Meeting, American Institute of Electrical Engineers, Chappaqua-Hidden Hill, El Cajon, Alpine City, N. J.

Oct. 18-19-20—1967 Annual Convocation, American Institute of Electrical Engineers, Chappaqua-Hidden Hill, El Cajon, Alpine City, N. J.

Oct. 21-22—Canadian Astronomical Institute—Institute of the Accountants Society Meeting, Montreal, Canada

Oct. 22-23—Conference on new development in the field of power, American Society of Mechanical Engineers, Worcester Hotel, Worcester, Pa.

Oct. 23-25—1967 Annual Safety Congress, Conrad Hilton Hotel, Chicago.

Oct. 24-25—Southwest Annual Display, Aircraft Electrical Equipment, Aircraft Lineup, San Diego, California.

Oct. 28-29—Third Annual Meeting, Association of the U. S. Army, Mission Park Hotel, Washington, D. C.

Oct. 28-29—First National Conference on Applied Meteorology, Hotel Statler, Houston, Tex.

Oct. 28-29—Annual East Coast Conference on Electronic and Navigation Equipment, F-106 Regiment Assembly, Baltimore, Md.

Oct. 28-31—Second Winter Meeting, American Nuclear Society, Elton House Hotel, New York, N. Y.

Oct. 28-29—National Industrial Packaging & Handling Exposition, Atlantic City Convention Hall, N. J.

Oct. 30—National Industrial Equipment Show, U. S. Grant Hotel, Los Angeles.

Oct. 31—1st Annual Annual Meeting Professional Group on Nuclear Detectors, Henry Hudson Hotel, New York.

Nov. 2-3—Second World Management Congress & 1967 Annual Meeting, American Society of Certified Public Accountants, Hotel Statler, Chicago.

Nov. 4-5—Fourth Institute on Electronics in Management (concurrent date preceding meeting), The American University, Washington, D. C.

Nov. 5-7—Joint Veterans Industry Control Seminar, Reliability Seminars (hosted to share with Soviet industry discussions) Naval Air Warfare Test Center, Pt. Mugu, Calif.

Nov. 6-8—Third Annual Symposium on Advanced Communications, Hotel Utica, N. Y.

Nov. 7-8—National Meeting, American Society Management, Institute of the Accountants Society, Statler Hilton Hotel, Dallas, Tex.

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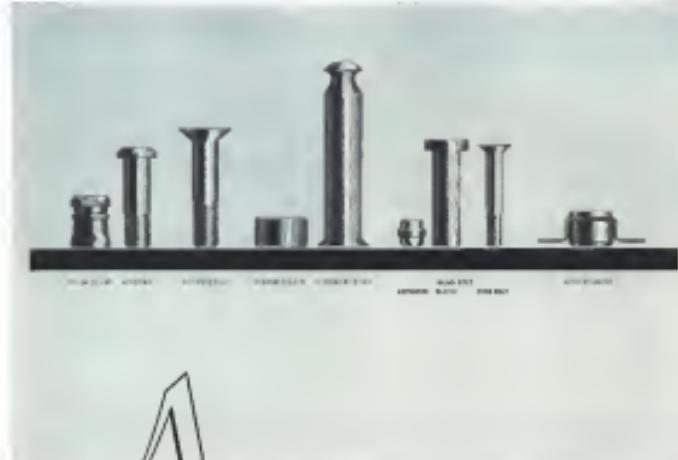
Another LINEAR first—a new, low compression-set Butyl Compound for use in "O" Rings. LINEAR Butyl Compound 7806-70 is a seal material that withstands compression set at elevated temperatures without being permanently deformed or losing its resiliency and its value as a seal. Also, Butyl withstands the chemical action of the non-flammable phosphate esters such as "Skydrol", "Pyrostat", "Galatene" and "Landel".

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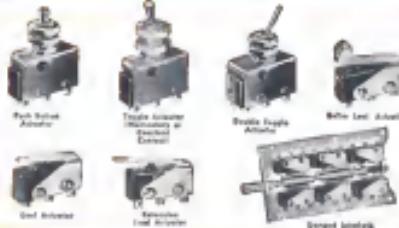
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# Switching Problem?

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Resistive load:  
Switches rated:  
Switch model:  
A current rating:  
An angle of:  
For applications:  
Wires to:  
Data Sheet: SG-3



## TYPE S SWITCHES

### Series SG

SPDT, 2 circuits, 10 amps, 125/250 v. AC, 20 v. DC and 1000  
watts resistive load: 1000 ohms max.  
Switches rated:  
Switch model:  
A current rating:  
An angle of:  
For applications:  
Wires to:  
Data Sheet: SG-8



## DOUBLE-POLE SIMULTANEOUS ACTION

### TYPE D-8

DPDT, 4 circuits,  
10 ohms, 22 v. DC and  
10 watts resistive load:  
Right-hand switch: 1000 ohms max.  
Left-hand switch: 1000 ohms max.  
Push-to-break contacts:  
Wires to:  
Data Sheet: SG-2



## HERMETICALLY-SEALED DOUBLE-POLE SWITCH

Model for

Data Sheet SG-3



DPDT, 4 circuits, 10 amps, 125/250 v. AC/DC, 20 v. DC

Right-hand switch: 1000 ohms max.  
Left-hand switch: 1000 ohms max.



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September 23, 1987

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## Who Really Develops Missiles?



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the ballistic missile field, the Army scientists are far beyond their technical capabilities. This is the main reason they have developed the cult of Redstone and the former German scientists.

Werner von Braun and his able group of former Prussian scientists represent virtually the Army's entire technical capability in that field. Consequently, the hardened Army brass drags them almost hysterically for shelter in the technological storm that is revolutionizing the military position.

In fairness to the group of civilian scientists now working at the Redstone Arsenal and their technical and spiritual leader Werner von Braun, it should be pointed out that they do not make these claims on their own behalf and, in fact, are still embarrassed by the frantic claims made for them by their more technically naive military and public-relations supporters. It is the un-informed leadership of the Army supported by a crop of professional and amateur public-relations promoters who are responsible for spreading the myths of missile development and it is on them that the blame for this shameful performance should be firmly fixed.

As we have emphasized in other editorials (AW March 18, p. 21) ballistic missile development in this country has been carried out by all three services—Air Force, Navy and Army since the closing days of World War II. There are no facts in missile history to support the Army's claim for a monopoly in the field. The Army deserves credit for its work with the captured German V-2s, the development of the Corporal with the help of Fairchild Rubber Co., Goodyear tires and the jet propulsion laboratory of Caltech, the Hercules project with General Electric technical support and the Redstone, for which von Braun's group of former German scientists deserve equal credit for what relies on a North American Aviation J35 rocket engine for its propulsion. We know of no Air Force or Navy effort in heat or ballistic missile work. Why then has the Army's unadorned brass embarked on a campaign to glorify over and before all other ballistic missile development done by the aviation industry for the Air Force and Navy?

The technical history of the Convair MX-3775 project, which first proved out the novel rocket control system, the North American NUTRIN program, the Martin Co. Viking program and Aeroprop's Aetos series are too well known among missile technicians to require detailing here. No amount of Army propaganda can expunge them from the authentic technical history of the missile era.

The Army's current fever pitch of propaganda really stems from an enormous technological inferiority complex. The Army is the most technically naive group in the three military services and was the last to realize the vital necessity of harnessing the glistening new technologies of nuclear fission and semiconductors to its interests. With the exception of the Corps of Engineers, there are few high ranking Army officers who have even a smidgen of technical training or education. Even at this late date, there are only a half dozen Army generals who can fly in aircraft. The new chief of Army aviation is just now learning to fly at an advanced age. After he was given the Army's top aviation post, in

the ballistic missile field, the Army scientists are far beyond their technical capabilities. This is the main reason they have developed the cult of Redstone and the former German scientists.

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It is most that the technically naive Army brass are trying to write the line and scope of Redstone's work into a ballistic missile monopoly when, in fact, their program is based in no small degree on the technical interchange with USAF, Navy, NASA and the aviation industry.

For example the Army propagandists have "leaked" stories to daily newspapers that the Redstone group "solved" the nose cone reentry problem. Redstone has contributed some excellent work in this field with its Jupiter C multi-stage assault vehicle but to has NASA with its blunt nose cone development, USAF and Lockheed with the X-17 research rocket and General Electric and Avco with their plasma jet and shock tube studies. No one of these agencies has a monopoly on "solving" the nose cone reentry problem, and all would agree that the solution is developing as a result of the broad-based effort and constant interchange of information rather than from a blinding flight of genius from a classified group.

The Army is playing a despicable game of military politics with its missile armamentarium to regain the prestige and importance it has already lost by its tardy recognition of the revolutionary importance of science and industry in modern warfare. It may readily dismiss the missile warhead immediately, but no amount of Army propaganda will alter the basic fact that real progress in the development of missiles or any other highly technical weapon system depends on the efforts of many science agencies and industrial teams, and no single agency or industrial group has a monopoly on development capability in any field of science. —Robert Hets



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9. Actuator, air-actuated	24. Valve, bleed
10. Actuator, air-actuated	25. Valve, bleed
11. Actuator, air-actuated	26. Valve, bleed
12. Actuator, air-actuated	27. Valve, bleed
13. Actuator, air-actuated	28. Valve, bleed
14. Actuator, air-actuated	29. Valve, bleed
15. Actuator, air-actuated	30. Valve, bleed
16. Valve, bleed	31. Valve, bleed
17. Valve, bleed	32. Valve, bleed
18. Valve, bleed	33. Valve, bleed
19. Valve, bleed	34. Valve, bleed
20. Valve, bleed	35. Valve, bleed
21. Valve, bleed	36. Valve, bleed
22. Valve, bleed	37. Valve, bleed
23. Valve, bleed	38. Valve, bleed
24. Valve, bleed	39. Valve, bleed
25. Valve, bleed	40. Valve, bleed
26. Valve, bleed	41. Valve, bleed
27. Valve, bleed	42. Valve, bleed
28. Valve, bleed	43. Valve, bleed
29. Valve, bleed	44. Valve, bleed
30. Valve, bleed	45. Valve, bleed

\*Kidde Co. designed to cooperation with and manufactured by Kidde Division of Precision

**Walter Kidde & Company, Inc., Aviation Division**  
**911 Main Street, Belleville 9, N. J.**

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**Walter Kidde Pacific, Van Nuys, California** • **Walter Kidde & Company of Canada Ltd., Mississauga**

## WHO'S WHERE

### In the Front Office

**Ron Norden**, a director and the director of engineering, Bausch Electronic Products Inc., Plainfield, N. J.

**C. G. Hababuk**, a director, Sperry Grumman Corp., division of Sperry Rand Corp., Great Neck, N. Y.

**Charles G. Tolkaugh, Jr.**, a director, Administrator Committee, members, and vice presidents—engineering, maintenance, and parts, Bausch Electronic Corp., Denver, Colo.

**Edwin D. Compell**, vice president of maintenance, Laboratories for Electronics Inc., Boston, Mass.

**Albert H. Clark**, vice president—manufacturing, Cross Roads Co., Bremerton, N. J., recently appointed manager, Ma Clark, vice president—engineering.

**Opie W. Tolson**, vice president—engineering, Starkie Aviation Corp., Denver, Colo.

**Ronald H. Strover**, vice president and general manager, Sperry Avionics Inc., Binghamton, N. Y., New York, N. Y.

**Richard T. Orth**, vice president—planning, Sanders Associates Inc., Nashua, N. H.

**Dr. Bernard Jenkins**, vice president of research, General Telephone Corp., Jamaica, N. Y.

**James E. Nease**, vice president—engineering, Clevite Corp., Cleveland, Ohio.

**William H. Caud**, vice president—manufacturing, Schenck Manufacturing Inc., Long Beach, Calif.

**John B. Mackayney**, general manager, Avco Corp., Woburn, Mass., General Control Division, Cincinnati, Ohio.

**Ralph E. Kehell**, vice chairman, executive to the president, Air Transport Association of America, Washington D. C. Also: Donald B. French, executive to vice president—planning.

**Capt. James F. Davis, Jr.**, Operations Officer and Capt. Robert D. Cox, Jr., Technical Director, Naval Aviation Supply Office, USN, Philadelphia, Pa.

### Boards and Elections

**Len W. Jones**, president of Liteltron Inc., has received the Navy's Distinguished Public Service Medal for his outstanding contributions in the field of Naval avionics and for control system projects, including the Liteltron 1000 system and digital computers for bombing and navigation.

**Thomas Wulff**, of Thomas Wulff and Associates, has been appointed executive director of The Aircraft Service Association, Los Angeles, Calif.

### Changes

**William H. Salsbury**, manager, Instrument Division, Thomas A. Edison Industries, West Orange, N. J., has been appointed special projects manager, the Helio Corp., El Segundo, Calif.

**Charles A. Wertheimer**, engineering staff specialist—avionics, Systems Planning Division, division of General Dynamics Corp., San Diego, Calif.

## INDUSTRY OBSERVER

► Nike graded missile systems includes an unguided missile with a range between that of the Hercules and Zeus. Intended for use against slow vehicles such as JCBs, the weapon will not be developed until the Army's role in its defense is clarified by the Defense Department.

► Army's Hawk will be a much simpler weapon to operate than any of the Nike series. Most of the ground detection work will be eliminated through use of the Hawk's internal guidance system. Low operating altitude of the Hawk prevents use of omnidirectional guidance of the Nike type.

► Extremely sensitive magnetometers for submarine detection, which is reportedly capable of detecting change of only one part per million in strength of earth's magnetic field, is one possible application for a new type Maser developed by French Atomic Energy Laboratory. New device, which operates at audio frequencies at room temperature, makes use of processes of Isinglas which is liquid metal of electron precision as in previous volatile Maser (AW Aug. 19, p. 76).

► Martin Co., which now has contracts for 24 POMS StarMaster jet seaplanes, is installing landing capable of a production rate of 100 of the aircraft despite the cutback in the program by Navy (AW Aug. 26, p. 33). Third StarMaster prototype is scheduled to begin flight tests this fall.

► Douglas Aircraft Co. is asking the body Oct. 11 on the design and manufacture of the duplex generator portion of the flat tube landing panel assembly of a landing gear for Nimitz. One and a half years can be allowed for the design and development. Unit would take information from the main compass and turn it into a form suitable for display on flat tube and other portions of the duplex.

► An Defense Command has issued a requirement for Navy-type arresting hooks for three F-105s series fighters—the McDonnell F-101, Convair F-102 and Lockheed F-104. ADC also will need overrun barriers at least or all of its bases. Reason is that the command has lost over \$12 million worth of fighters during the last 12 months because of overhooks.

► General Precision Laboratory is negotiating with Densim Navigation Systems Inc. and Bendix Pacific, Bendix's Natick, Mass., and Canadian licensee, over the possible marriage of General Precision's Radar Doppler navigator with Densim hyperbolic navigation system and/or Densim flight leg cockpit display display.

► Experimental verification of Houston's special theory to stability will be attempted by RIAS Inc., subsidiary of The Martin Co., sometime this fall. Theory says that when a moving object approaches the speed of light, mass approaches infinity and time approaches zero. Theory will be tested by accelerating sodium atoms to very high speeds and then attempting to measure Doppler shift of the element's characteristic light frequency. Similar experiment was performed in 1968, but RIAS scientists hope to improve measurement accuracy by one or two orders of magnitude.

► Avco believes STOL aircraft may need new type instruments or automatic controls to ease pilot besides. Tests at University of Washington indicate aircraft's climb rate potential, particularly on landing.

► Army is investigating large diameter, low pressure tire for use on unpressurized landing gear. Special landing gear would include valve assembly connected with load sensing device. It would automatically reduce tire pressure in respect with the ground.

► Republic Aviation Corp. will make a decision within the next 180 days as to whether it will go ahead with plans to produce the Sof Aeronautics light helicopter under license. Aircraft officials completed Phase 2 evaluation tests at Edwards AFB, Calif., and USAF officials are reportedly enthusiastic over its performance.



# Air Force to Continue R&D Cancellations

**Fundamental research programs to get some relief; guidelines for all contractors expected soon.**

**Washington**—USAF, some of the most aggressive and costliest created by stop-gap funding measures in its research and development program, is taking quick contracting steps. It hopes to have preliminary guidance for contractors by the middle of next week, but officials point out that spending flexibility—and therefore costliest—will continue throughout the fiscal year.

Outlook for further research and development cuts before Jan. 1, USAF, like the Defense Department (see page 27), is taking steps to spending cuts as it stands, but administration imposed ceilings in spite of stringent economy efforts.

Fast and violent reaction to research and development overruns came in the area of fundamental research (AW Sept. 16, p. 27).

The agency quickly gathered joint countermeasures at higher Air Force levels.

Universities and other non-profit or not-for-profit organizations charged that removal of contracts has been at a standstill since July 1 and cut current contributions. USAF also, recently, withdrew project cancellations of experiments of the work of universities and long-range effects on the contracts.

## USAF "Pushed"

One university spokesman told Aviation Week that USAF "has been pushed by a bunch of bookkeepers."

USAF is often admitted that that is what happened. A quick look at the ledger by financial experts indicated the most immediate money was to be made in basic research contracts, where no longer, if ever, available, after cancellation of research work has been awarded for, removal of contracts falling far below high spending while officials were trying to determine how high spending was.

Risks for commitments made in Fiscal 1977 are falling fast and won't be paid. Costs are being account under contracts still in effect, but the cut-off date, where no longer available, has been extended for, removal of contracts falling far below high spending while officials were trying to determine how high spending was.

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## Contract by Contract

"We have got to go piecemeal and try by contract and contract at what rate they actually are going to spend before we can know what we can do about present work or new contracts," an Air Force official said.

"But we are trying to rapidly somewhat the question of fundamental research contracts that have already gone. We are getting into a position where we can take the program into account, others at least by the best they expect."

Soon afterwards, Air Force hopes to get the universities some planning in formulating some idea of what will happen to contracts well ahead of the fiscal

that they expect. Air Force warned, however.

"But that is not to say that there won't be some cuts in fundamental research contract, or that we can do without continued flexibility. It is a question in research work that you need reliability.

"That is one reason that fundamental research is an early target. In one sense you are least selective at the fundamental research end, when you are in effect trying everything, and most selective near the production end, where you have chosen only what you want to go on with."

Outlook for industrial contractors is essentially the same as for non-profit contractors—mostly new and older contracts to account for more non-profit objectives available in the economic environment from now on.

One highlight in USAF's decision making will be Jan. 1, USAF's \$17.9 billion spending ceiling for all its activities but a billion into \$5.9 billion for each half of the fiscal year. How actual spending trends relative to the goal for Jan. 1 will determine much of what will be done from then until the end of the fiscal year on June 30.

Although the USAF research and development appropriation for the fiscal year is \$661 million, spending at the current rate would exceed that amount.

Thus, USAF must somehow temporarily bring the spending curve down below the \$661 million line in order to eventually stabilize it at \$661.

## ARDC Results

Reshuffling of Air Research and Development Command facilities and assets, budgets, etc. are not firm now and won't be for some time (AW Sept. 16, p. 26).

But spending ceiling for Arnold Engineering Development Center, for example, is approximately 25% below its appropriation for Fiscal 1978. This has resulted in layoffs, and some cuts in ongoing work.

An Air Force Office of Scientific Research, with about 600 contracts, has already fallen far below the rate of about \$3 a month. This means that a cycle is anomaly stretching well into September has thrown the program into considerable confusion. Other centers have been taking similar action, namely WADC and AFPC. Personnel and Training Research Center at Lackland AFB, Tex., has been one of the hardest hit.

Test bases do less contract work, and therefore are affected in different ways—paramount in all, limited construction of new facilities, some decrease in

AVIATION WEEK, September 23, 1978



**Large Dive Brake Slows F-106 Crusader**

Large dive brake lowered under Convair F-106 Crusader's belly effectively slows supersonic photo-reconnaissance plane so that it can keep up with plane from which the photo was taken. This is first picture showing Crusader's dive brake opened. F-106 is the one in which Maj. Glenn Brink completed speed record (AW July 22, p. 30).

notional. These include AFDC at Holloman, Texas; Flight Test Center at Edwards AFB, Calif.; Marine Division Center at Holloman AFB, N. M., and Missile Test Center at Pease AFB, Fla.

## University Charges

Universities and other non-profit research groups, showing a "flat" contract rather than work that produces hardware change, that USAF enclosure actions so far have:

- Severely shaken confidence in USAF as a supporter of research. USAF is possibly aware of this result and is making every attempt to correct it.

"The last thing we want to do is damage the morale and confidence relationship we have had with these groups," one Air Force official said. "We recognize what the immediate and the long-range effects would be. We think it is partly a question of communications and that is being worked on. But we also are finding that where you're bumping one head in a sprawling ending you get shoulder-to-shoulder next time."

- Cuts at the worst possible time, beginning again in a semester year, when professors and graduate students are assigned to and supported partly by specific research contracts.

- Ignored necessary lots of life work for fundamental research work. An fiscal estimate of spending for this period is incongruous with research.

- Threatened to waive many assays that they gave. In some recent cases, no provision was made for recording and summarizing work done

that for. Therefore, USAF gets nothing for the money spent and cannot continue the use of half of the economic program brightness.

Consequently, orders from some contractors to cut overhead by 5% on all contracts, and failure to act on proposed new contracts have created problems.

But failure to review contracts that otherwise would have been removed about automatically has been largest cause of complaint—along with validity of most USAF project priorities to give any indication what to expect on contracts in the future areas.

## University Reaction

Some examples of university reactions:

- University of Michigan's Engineering Research Institute is of last week held 50th Air Force research conference. The flag it held with one reader had been crossed, although there were in a area which has too high research priority. Others with other centers, even though they had lower priorities, had been left out. That last sentence on research problems convinced AFOSR, its contractors with that office had been left out. The flag finally resulted involved \$125,000 to keep track of the research and work, already committed for. They have involved 30 individuals. On same note, the Institute was told to spend a sizable rate of expenditure which it expected. On effect, it was told to make a 5% reduction in dollars authorized but uncommitted as of the end of July.

"Before we had X dollars and no limit on what to spend them. Now, we are being told to determine how much we can spend for August, which is part. We can't live within that limitation."

- "We are exploiting our position as an Air Force contractor and an area research, last, we feel, affected the availability of Air Force contracts."

- Massachusetts Institute of Technology. One of USAF's biggest research contractors among the universities, MIT has been most severely impacted by the cut, of course, to find out what the research and development cost will be.

"If there ever was a state of confusion the Air Force is in it," a spokesman said. "In trying to find out what is going on, we are looking through so almost completely opaque windows. MIT points out that timing of cuts is

critical that these facts indicate" a "goodwill for the Institute and "The Institute is not unique. It is a part of the overall," it concluded. "Research partly the instructional operation of the university, for the benefit of teachers and graduate students. Some contracts are not clearly concerned with the academic work but are strictly public service.

"Being a non-profit organization, we can't afford funds to hold personnel and continue the work. We can't wait until the government's pleasure to do so. When contracts are canceled, we have to either bid back for the services or other projects or let them go."

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most unfortunate because the education of engineers, after a seven decade, had taken its course. Graduates last year had reached the 30,000 level over signs. Interest and enthusiasm of researchers and potential researchers will decline rapidly if support is withdrawn—or even delayed for too long.

\* **Convair Astronautics, Louisville.** Convair may never have had a greater effect yet. Phillips says, "that flight test program created a whole new industry which has gone from being worth \$50 million to \$1 billion a year."

Convair's contract with the Air Force has been more than a success, and using USAF's present way that can't and can't be done under it.

\* **New York University.** NYU holds about \$1 million in Air Force contracts, measured in annual value. Major concern here is over the potential damage to the state of science generally in the country, especially since funds support so many graduate science students and provide a basic training program. Contractors have not been a problem, Phillips says. "We have followed a few very basic principles concerning contracts: the degree of confidence. This is a hypothesis that the USAF are one spokesman and 'I have never seen a paper of that kind in research.'

Reserves are the greatest problem from the standpoint of dollars and planning. "Whether as the Air Force is going to continue a research program in Air Force's concern, probably," the spokesman said. "But they should not be in the position of having to tell us that just don't know whether they're going to continue it. They should not assume that they're wrong. When there is no money available, let's say, there is none and enough around for it and maybe you can pick up where you left off."

\* **Ohio State University.** Research foundations and it has had a few "extreme instances on some contracts of orders that we can't possibly comply with because they were issued without the contract officer having looked into the specific contract sufficiently." It has also different orders from different AFDC centers, with no pattern of consistency.

One spokesman said, "In September we got orders telling us what we can't spend in September. We also see that we cannot spend by the end of September money already spent by the end of August. It is ridiculous on the face of it."

All contractors consulted agreed that 5% more or more could have been taken in stride with proper advance notice and some flexibility. But they emphasized that it is very difficult to estimate either expenditures by base period or overall expenditures under research contracts. An estimate within 10% is considered very good. Therefore being added to reduce contracts by 5%

5% across the board is surely impossible.

Some USAF letters to contractors said that cuts be made in overhead and fixed charges but not in direct labor. But 5% of the whole cost of a project may equal 30% of the overhead. Attempting to cut overhead costs can administrators bring on direct labor and decrease labor's research productivity. Air Force's greatest problem in this regard is that scope of its research programs not only is much greater but has been expanding more rapidly.

## Gen. Irvine Tells Industry to Get Tangible Product for Pay Check

**Los Angeles.** One of the biggest problems facing the economy and the aerospace industry in particular is to find ways of ensuring that something significant is produced when it is being built up so that we can then have something to work with, Lt. Gen. C. S. Irvine, USAF's deepest chief of staff has materialized, told the Electronics Industries Association's National Council of Management and Technical Services for Machine Tools last week.

Gen. Irvine said reducing employment or cutting wages is an solution to the inflation problem. The purchasing power of money, he said, can only be increased by increasing productivity per hour and per dollar. Since military expenses are such a big part of the economy, the services must make much of the improvement by improving the ratio of manpower to cost, which is the same as cutting the cost of goods and services, he observed.

The General cited numerical machine control as a means of tripleing productivity and in a few cases of multiplying it by a factor of six or seven as 23 to 30 better value than engineering effort, he said. USAF will require more progress from one design generation to the next. An example, he said, will be the Mach 2 fighter generation will be replaced. New designs were to capable of Mach 5.

### Missile Cuts

While emphasizing the enormous necessity of streamlining expenditure expenses, Gen. Irvine emphasized the importance of cutting intelligently. "Every way and then we have our self a little more than that. Sometimes we have cut a little more than that."

Pointing out the importance of precise defense production, he said, "If we come, the Services will have the advantage of choosing where, when and how we will be bought. We can certain that we will do our job or fail to do it with the ingenuity that are on the end of the mirror when the war starts. We want to make all the time."

Astronautics is the best answer to the cost management of defense, Gen. Irvine

and others believe about what research is going to continue to support.

One of the most frequent observations made by universities was that the Office of Naval Research and Army Research agencies have accomplished research contract savings with less reduction and greater efficiency. Air Force's greatest problem in this regard is that scope of its research programs not only is much greater but has been expanding more rapidly.

## Wilson Predicts More Hardware Cuts

By Claude Witte

Washington—Defense Department expenditures continue to run well above the level of a \$38 billion ceiling, and there is a substantial possibility that new aircraft procurement cuts will be ordered after Oct. 1.

With one week left in the first quarter of fiscal 1958, Secretary of Defense Charles E. Wilson underscored expenditures for his department and all of the \$40 billion cuts on the basis of figures for July and August.

As a result of further cutting cuts, Wilson has this week announced an other cut of 100,000 in military per-

sonnel. He had ordered an earlier 330,000 cut last July. Total strength will be down to 2.6 million by early in fiscal 1959.

Strength at last month and goals for next fiscal 1958 are: Army 990,000 and 900,000; Navy 673,000 and 645,000; Air Force 912,200 and 871,000; Marines 198,383 and 188,083. Marines also want out another 8,000 early in fiscal 1959.

Industry chairman in the capital were not optimistic and suggested that there must be a big improvement in the rate of expenditure as talked on Oct. 1 or there will be more cancellations, stretch-outs and delays.

USAF has announced no new price gains changes, but Navy has work canceled, the Triton guided missile, on which it has spent about \$25 million. Triton was a surface-to-air missile developed by Johns Hopkins University, McDonnell Aircraft, Goodyear Aircraft and the Kortright Co. of Clifton, N. J., were industry participants.

Previous changes in military aircraft procurement include:

\* Cancellation by USAF: North American Navaho guided missile, Republic F-105, North American F-107, Douglas C-112.

\* Stretch-outs by USAF: Lockheed F-104, Republic F-105, McDonnell F-4H.



JetStar Flies

Passenger 10-passenger Cessna 441 jetstar light jet (airline transport) is shown at Edwards AFB (right) prior to first flight (right) on schedule. Plane has two Pratt & Whitney engines in place of two PJs at 115% on each side to support flight test program, pending certification of the small U.S. jets. Built with Lockheed funds, Jetstar is designed to meet USAF transport/mission requirements in addition to CAA regulations, including its application to make it a business transport. Company says it is designed to exceed operational costs. Cruise speed is more than 500 mph.



Connie P-406, Boeing B-52, North American F-100.  
• **Concentrations** by Navy: Douglas A-3D-1.  
• **Strikes** by Navy: Chance Vought F8U-1, Douglas F4D-1, Douglas A-3D-1, McDonnell F3H-2.

While the economy was contracting to keep both production and research and development effort (see page 25), there was a report from Hawthorne, Ala., that the Chrysler Corp., builder of the Army B-57B strategic plane, had taken a new plant out of Radcliff, Ky., for production of the Japanese intermediate ballistic missile.

#### Jupiter vs. Thor

While actual fate of the Jupiter and USAF's Thor programs were being decided at the Pentagon, it was reported that Chrysler had started to evaluate its potential at Hawthorne. While the Army Ballistic Missile Agency denied the rumor of a new plant, Tom F. Morris, a vice president of the company, did not deny the report. Morris said: "There is nothing I

can tell you at this time. There is too much going on now, security-wise, to say anything."

The Hartline report and Chrysler's plan to spend \$300 million on the plant, a figure that would seem staggering because it would make the factory about the most expensive facility of its kind in the nation, Chrysler already has defense facilities in the Detroit area, some of them built with the aid of government money.

#### USAF Policy

Strategic Defense Department decisions on the IRBM, it was decided, that USAF could stick to its policy of having an armament testing plant unless the need is proven otherwise.

On the other hand, there was evidence that Chrysler may be encouraged by Army interests. The company has been conducting an elaborate advertising campaign boasting the merits of the Redstone and Jupiter projects and paying tribute to Army's missile program.

During production costs, an important factor in testing this action was the cut in lead time. Equipment was being delivered ahead of schedule at industry and government efforts in this field by far off.

Cook predicted that in the future there will be fewer parallel development programs because economies will dictate early choice of a weapon to be put in production.

He said this trend was responsible for cancellation of the North American Navaho and predicted that the practice will be followed on future ballistic missile projects.

The AIA chief predicted that sub-contracting will be reduced. He said perhaps will take place as the workload decreases in defense and engine factories because "it makes little sense that a manufacturer whose facilities and work force are not fully occupied would continue to farm out work if he can do the job better and at lower cost." He said that the major guided missile program is of increasing importance to the aircraft industry and that the aircraft manufacturers are best equipped to design and build missiles. He deplored the development of missile in government aircraft and was surprised, pointing out that there is a loss of time and efficiency in moving these projects from outside agencies to industry for production.

#### Industry Delivers

Cook cited the decline in aircraft industry defense fact the past few years.

In airplane pounds, the figure fell from 140 million in 1953 to 130 million in 1954, 114 million in 1955 and 95.5 million in 1956.

He said USAF expected that the unit training point, with the achievement of target strength goals, would be reached in 1961.

Changes in this outlook, was found, he said, in the Defense Department's fiscal 1958 ceiling of \$58 billion in expenditures.

On top of increasing complexity and

#### Missile Interest

Starting interest in Missiles will be served by several factors that the firm presently perceives: there that new solid-state atomic amplifier can provide extremely low noise microwave amplification. Measurements made by Bell Telephone Laboratories and Los Alamos Laboratory show Missiles noise level (internally) 100 times better than existing atomic tubes. Some observers now predict that noise level requirement of between 100 and 1,000 the top theoretical limit, may ultimately be approached.

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#### New High-Lift Design Studied by Fairchild

Ingraham, Mid-Continent Aircraft Division reported last week that it has completed initial research on a high lift "jet wing" aircraft which the Office of Naval Research has authorized a significant step toward development of an entirely new concept of the future.

A Fairchild spokesman said the "jet wing," which divides the entire span of the powerplants over the wing trailing edge through boundary-layer type slots, is an extension of the blown flow high-lift boundary-layer control technique. The jet flap in the wing is, he said, another company spokesman, and, "will drop gear."

The research program, originally sponsored by ONR, was conducted under contracts held by the Navy's Bureau of Aeronautics and Army's Transportation Research and Engineering Command.

A new program to develop concepts for a contemplated "jet wing" prototype is authorized for completion in June of next year.

One possible application, Fairchild says, could be the use of military aircraft to haul and recover high performance aircraft incorporating the jet wing design. The company also said the design can be applied to commercial transports.

AIRPORT WEEK, September 23, 1957

## Short-Haul, Cargo Lines Must Re-Equip

Left, The Netherlands—A decade of economic and technical consolidation in civil aviation that will see cargo carriers and charter operators addressing the benefits and problems of new aircraft markedly increased with load. Last was forecast here was Arthur Raymond, Douglas Aircraft Co. vice president of engineering.

Right, In the foreground, the second and Douglas F-106 Phantom Missiles Adder, and the DC-8 generation of jet transports will not receive engines alone enough to open a supply of used aircraft for modification. Last carried before their present equipment must be replaced. Obsolescence of jet transports is anticipated, he said, because an performance improvement large enough to justify the purchase of a new design can be made with a supersonic type to meet economically practicable. (Left) are cargo derivatives of the 1970-1950 decade while the wings are too short and operating costs too high of supersonic speeds.

A major question is how the new transports will affect the cost of new equipment when this is compared to the cost of the present. The natural result of this will be that which batch replaces 10% of the present will a plunge into obsolescence. Technically, however, the growth of an stage has been continuing at an average rate of about 25% annually as a world basis. This growth is greater than that of highly regarded passenger traffic.

There are five major divisions of the cargo market:

- Emergency shipment
- Movement of high value goods.
- Convenience
- Short range of transport available.
- Jet shipping to save time.

Emergency shipping is today's prime market. One line has reported over 70% of its shipments are perishable or high value merchandise, medicines, spare parts for broken machines and other goods that fall into this sensitive category.

Outside the U.S., the difficulty of surface travel makes air cargo play a large role as the sole means of transport.

#### Cost Analysis

In a cost analysis of air freight, the costs of warehousing, packaging, handling, insurance, credits, damage, handling and administration must be considered as well as the transportation cost.

When all these factors are considered, Raymond said, it will be found that cargo airfares can be set more cheaply by air freight even at present rates.

Steady airfares indicates that the major role efforts of cargo carriers

right better be directed at the receiver than the shipper.

In many places in the world, air freight is growing more rapidly than in the U.S. Between 1948 and 1955, with increase in air freight was 246% as compared with 20% in the U.S. Canada passed 144% and India 56%. Economic growth of underdeveloped areas should produce streams of extra traffic to be handled in the west, South, Raymond.

It looks as if there is great potential, a forecast based on present national product indicates a further increase of 145% by 1965.

Raymond said the DC-10 long-haul cargo plane will bring down to South America would cut today's direct operating costs in one third. With a 50% breakdown rate factor, this would give the shippers a cost of 10 cents per ton-mile. At that price, Raymond estimated world traffic volume for 1967 at somewhere around 11 billion ton miles.

#### Terrific Structure

Regarding world traffic route structure in the next 10 years, Raymond said he expects no large changes in structure but rather changes in emphasis within the existing framework. He pointed out that shifted focus is one of fundamental importance in this field.

No short structure is possible he said with the current East-West division of the world since in most cases it prevents single stop operation from one economic center to another along the shortest possible route.

A long structure is not feasible either to get the extra range needed, therefore, lowering the cost of transportation to the traveling public. Another political problem is the question of traffic rights. When traffic rights are given in a foreign state, Raymond said, many operators will fail that their domestic rights are being invaded. In many cases the extension of traffic rights to foreign lines will provide beneficial as well as needed service. However, in some cases, he added, this will be local rather than general in nature.

Many smaller countries that have little to offer in the way of bilateral agreements often have flag districts in war with nothing to route but technical stops.

These can take advantage of great circle routes and may well take traffic from a domestic operator who must stop more often and use a more circuitous route.

# NMIC Promotes First Meeting; AIA Doubts Interest of Primes

Washington—National Missile Industry Conference is scheduled to hold an organization meeting later this week, disclosed by its spokesman as a series of press briefings to the well-being of the industry.

Aircraft Industries Assoc. reported last week that "probably neither prime contract missile companies nor top management of any companies have participated in the proposal for a NMIC."

While evidence of industry support for proposed group is not elusive, GAW Sept. 16 p 12, there were indications of a pronounced tussle between NMIC and Missile and Rocketeers magazine.

In addition to the first formal meeting now opened by Edward W. Hall, assistant editor of the magazine who said NMIC's "proposers" had asked him to serve as a central source of information with a Washington office is erected. Along with Hall's notes, went a letter from Eric Bryant, executive editor of Missiles and Rockets, inviting the addressed to take part in a three-day round-table discussion. Bryant has been a member of the group since its formation and NMIC '62.

Bryant was by no means an "outsider" in the meeting with the industry. The Hall letter makes it clear that NMIC will be the spokesman with Missiles and Rockets and that the plan will be an annual gathering.

## AIA Report

Meanwhile, the Coated Missile Committee of AIA has been advised by its Washington office that these are "the main pieces" of the agenda of NMIC '62.

An AIA memorandum lists some items where action is being said by NMIC promoters as "unfounded" or "inaccurate" in the proposed group. Management of at least two of the companies say they were bound by NMIC.

True identity of the industry spokesman of NMIC will not clear, if they can.

In a memorandum to the Coated Missile Committee, AIA reported:

"AIA staff personnel have made numerous inquiries concerning the proposed organization from sources of possible information, such as the Defense Department, several CIOs, both, usual AIA representatives, as well as the engineers Missiles and Rockets. Unpublished results of our inquiries do not permit a clear-cut picture of the origin of the proposed organization, the individuals who have interested

themselves in it to date, nor of future action."

Some of the companies whose names have been mentioned as either being interested in the NMIC or as members in its organization are:

- ♦ *Dynamic Engineering Co.*, Franklin Park, Ill.
- ♦ *General Chemical Division, Allied Chemical & Dye Corp.*, New York City
- ♦ *Avon Research Laboratories*, Cambridge, Mass.
- ♦ *Astronaut Corp.*, New York City
- ♦ *Reaction Motors Inc.*, Princeton, N.J.
- ♦ *Cooper Development Corp.*, Los Angeles, Calif.
- ♦ *General Astronautics Corp.*, Huntsville, Ala.
- ♦ *Heng Industries Inc.*, Whitinsville, Del.
- ♦ *Aviation Rocket Co.*, Wyncote, Penna.

"Internal checks made with an aggregate of a couple of the above companies have indicated no knowledge of the NMIC."

## Analysis

AIA's analysis of the information available is:

- ♦ The underlying purpose of the proposed NMIC appears to have a strong public relations flavor.
- ♦ "The proposal for a NMIC may bear some resemblance in its coverage for membership and its coverage to the proposal for a 'Coated Missile Institute' of several years ago."

## Airlines Say Baltimore Has Adequate Service

Washington—Domestic airlines last week defended their stand against diverting flights from Washington's National Airport to Baltimore's Baltimore Airport in connection with an imminent move to the subjet.

Airline representatives appeared before the Civil Aeronautics Board to testify as the adequacy of air service in the Baltimore and Washington areas.

U.S. Senator George A. Smathers told the CAB that their present air service to Baltimore is sufficient to meet the demand.

Baltimore representatives, on the other hand, contend that Friendship does not have enough scheduled service to merit the label of Baltimore and that a large percentage of its passengers are forced to go to Washington to board flights.



**MISSILES AND ROCKETS** Eric Bryant, executive editor of *Missiles and Rockets* magazine.

## New Semiconductor Aids Miniaturization

Colma, Calif.—Sylvania Semiconductor division developed what it believes is a silicon junction diode that performs the function of a variable capacitor, opening and in reflection of sun, weight in miniaturizing and cost minimization equipment, has been developed by Pacific Semiconductors, Inc.

Capacitors of the device is varied by changing the small dc bias voltage applied across its terminals. Pacific Semiconductor acknowledges that the basic phenomenon employed has been known for some time (U.S. April 3, p. 87). But this is the first to offer a reliable device on a regular production basis.

Working as a device is called can be used for range finding, modulation (FM) and other applications in which the device is required to reflect or retransmit. Device also shares a purpose as a replacement for varactor tube now employed in microwave frequency circuits.

In addition to small size and weight (comparable to semiconductor diodes), new device reportedly has the lower temperature coefficient than conventional variable capacitors.

Present production units are available with Q's of 15:1 at 100 m.

At present, the range of operation is 100 to 1000 m. However, Vinten Electronics, a new radar development contractor, is reported to be using the device in several possible applications, company says.

Vinten will operate over temperature range of -65°C to 100°C. This is expected to be comparable to conventional silicon diodes.

AVIATION WEEK, September 23, 1962

## 6th Anglo-American Aeronautical Conference:

# Titanium Applications, Testing Appraised

Folkestone—Steel contractors on the system of aircraft structures in the U.S. and Britain are continuing to exchange highlights of the sixth Anglo-American Conference here.

First important presentation of new experience with titanium in the industry by Los Schapiro and Ericson Liffmann of the Douglas Aircraft Co., looked off the most productive of the discussions. Another major technical segment covered aircraft structures by the philosophy of taking a complete structure to destruction exemplified by the water tank tests used for the Comet and Britannia airplanes.

Dr. R. K. Riddiford and Dr. P. B. Walker of RAE Farnborough took opposite sides in an exchange of comments that pointed the last residual interest of the first day meeting.

Schapiro reported fixed loads to destruction periods, and an astonishingly poor public defense system discrimination in small aircraft groups to fixed out metal problems.

## Unsuitable Protection

There were other comments from some delegates about quality of planes. As one example there was confusion leading that paper by Dr. J. V. Denslow on nuclear power applications. Denslow's paper was not well received, nor was it understood. Denslow, who is one of Britain's top aircraft technicians, was out of his depth discussing aircraft design approaches.

Inability of some loads brought other inquiries. Deliberations of Schapiro's titanium paper were not moving much—it was the most exciting and productive of the formal meetings, where Sir Sidney Green, chairman of session, attempted to close meeting because of lack of time.

Observing a conference assembled that Green had done the at an earlier Anglo-American Conference when he stopped the completion of a presentation as fast as possible, Dr. Douglas, author of the paper, was asked whether use of only 150 lbs of titanium in an aircraft weight hundreds of thousands was justification for large programs implemented by Douglas.

Schapiro, stating that he was beginning to sway away from the discussion, reported that his computer had not made a mention out of it. Douglas' whole approach had been a sales and conviction appeal of his paper.

## Guidle Pressure

Schapiro questioned why so little use had been made of long and brittle Schapiro replied: there was interest had and little use general and that on a weight/ratio basis, there had been little radiocast to take severe loading problem of titanium with modulus of high strength steels with good fatigue properties.

British opinion on use of titanium was divided, but a number of speakers, mostly from Short Brothers and Hawker, advised that more attention should be paid to its exploitation in aircraft aircraft, as distinct to pressure vessels, as well as practically all of these were due to inherent metal characteristics.

Short Brothers measured they had had a complete integrity and fatigue test for 140 hours at an elevated temperature after 1000 hours of Schaffer's machining techniques, company said, had been established in largely such as oriented bolts, levers, wire root attachments and fittings. Problems reported by Short on sheet friction welding included thickness variations, hydrogen embrittlement and up to 0.3% decrease in fatigue life.

## Compressor Blades

Rolls-Royce was the only other company reporting on use experience. It said, reporting, titanium had been used "highly metallized" for some time and the particular advantage was the reduced disc weight possible. Disc blades used commercially pass metal but magnesium was added later, the company reported.

Dr. A. E. Russell, chief engineer, Bristol Aircraft Company, discussed the full life and safe life philosophies and ended an argument with Dr. P. B. Walker of RAE Farnborough who had been associated with the war-time fatigue test program for the Comet. Russell maintained that using a constant stress rate, instead of a fluctuating one, the critical fatigue stress on which inspection of aircraft would be concentrated.

## Some Weaknesses

Russell said he was strictly against the weaknesses of extending a complete modal analysis for "professors twiddling of inspection" and insisted that simplified detailed rating of specimens was required.

But Russell also warned that tech used restrictions to inspection needed to be completely reviewed and that the full life philosophy he advocated should not fail to complement an design process.

An American Airlines spokesman, citing the losses of up to 15% of flight in each of two of its aircraft due to mechanical failures, called for less complexity of board of explosive decompression and more design concentration considerations in main gear landing damage.

The conclusion of meeting was at G. W. Flanagan's presentation of work done at NACA's Ames Laboratory on increasing modal life with boundary layer control.

Dr. G. V. Lambirth, who leads Hawker's research in the field, had high prou-

for Harper's paper, saying there were three special points:

\* Concentration on gimbals and supporting details needed to fit a gimballed low power homopolar system in the air.

\* Presentation of aerodynamic data is a simple way to fit these parts into the wind tunnel. Intensity could be used (it).

\* Removal of the "red herring" that power structures needed to be distributed evenly blocked up in one.

After the meeting, a memorandum from Mueller Page to Vickroy indicated the service will be reviewing British work in this field. Vickroy did point to the Saunders, later converted aircraft developed by Australian aircraft Works which uses a system of inertia switches placed near all three

boundary layer thicknesses apart and acting as a transition section. The return goals, to lower the inertia quantities involved with only small reduction in lift coefficients.

He also said his company is using an extensive shuttle optical system which enables aircraft using BLC to approach an aircraft instead of elevators and that combat plane flight path characteristics it speeds up minimum dog speed.

#### Speed Goal

Rolf Rauke claimed that the few characteristics of the bypass engine made it ideal for BLC research and until it could supply air for bleeding with out a Horse penalty. By J. H. Rauke, a senior engineer at Nira's Duxford Laboratory and they are trying to obtain speeds on

the order of 16,000 fpm with 60 mm propellers fixed in a 3,000 ft pressurized cage. Rauke, who discussed the use of hydrofoils in aircraft and missiles, said that one of the problems was determined to be hard to see boundary layer clearly. The new 1,000 ft range is now under construction.

#### Stalling Rudder

Franklin K. Moore of Cornell Aeronautical Laboratory, who presented a treatment of boundary layer unloading, pointed out that the best way of doing this is by stalling the rudder in the case of high aspect ratio wings in high lift VTOIL or STOL applications. He said that usually occurrence of a boundary layer separation point would also be an obviously powerful mechanism for generation of lift.

## Aircraft Firms Submit Financial Figures

Financial details reported to the House Armed Services investigating Subcommittee by five major manufacturers in connection with the subcommittee's proposed investigation of 17 aircraft engine firms (AWW Apr. 1, p. 20) are shown below. Despite much publicity by the subcommittee's chairman, Rep. Edward H. Boland (D-Ma.), as the importance of the project, it was dropped because members did not want to witness in Washington beyond congressional session.

General Electric Co. Aircraft Gas Turbine Division	
	1963
Total Sales	\$10.5 billion
Sales to U. S. Govt.	\$100 million
Percentage of total sales	1%
Net worth	\$17.5 billion
Contracting stock	\$179 million
Dividends, except per share	\$103 million
Research and development	\$10 million
Total value of contracts, payments, and receipts, Dec. 31, 1962	\$10.7 million
Divs and distributions	\$10.4 million
Payments paid to Aircraft Industries Assoc.	\$10.4 million
Research and development expenses	\$1.7 million
Contracted and received property	\$10.9 million
Profit	\$10.5 billion
Per General Electric Co. as a whole	

Avco Manufacturing Corp. Licensing Division	
	1963
Total Sales	\$103 million
Sales to U. S. Govt.	\$40 million
Percentage of total sales	39%
Net worth	\$17.5 billion
Contracting stock	\$103 million
Dividends, except per share	\$10 million
Research and development	\$1 million
Total value of contracts, payments, and receipts, Dec. 31, 1962	\$10.7 million
Divs and distributions	\$10.4 million
Payments paid to Aircraft Industries Assoc.	\$10.4 million
Research and development expenses	\$1.7 million
Contracted and received property	\$10.9 million
Profit	\$10.5 billion

Westinghouse Electric Corp. Gas Turbine Division	
	1963
Total Sales	\$100
Sales to U. S. Govt.	\$10 million
Percentage of total sales	10%
Net worth	\$12 billion
Research and development	\$1 million
Total value of contracts, payments, and receipts, Dec. 31, 1962	\$10.7 million
Divs and distributions	\$10.4 million
Payments paid to Aircraft Industries Assoc.	\$10.4 million
Research and development	\$1.7 million
Contracted and received property	\$10.9 million
Profit	\$10.5 billion

United Aircraft Corp. Pratt & Whitney Aircraft Corp.	
	1963
Total Sales	\$100 million
Sales to U. S. Govt.	\$10 million
Percentage of total sales	10%
Net worth	\$12 billion
Research and development	\$1 million
Total value of contracts, payments, and receipts, Dec. 31, 1962	\$10.7 million
Divs and distributions	\$10.4 million
Payments paid to Aircraft Industries Assoc.	\$10.4 million
Research and development	\$1.7 million
Contracted and received property	\$10.9 million
Profit	\$10.5 billion

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Type 3-5200 Rotary Actuator for Missiles. Weight 1.45 lb. Power 120 watts at 54.0 RPM, 20 volts, 21 amper. Military Spec. MIL-STD-129. Max. torque 1.25 lb-in. Static load 12.5 lb. Dynamic load 1.25 lb. Rate of travel 3.75 per second. Response 3.0 ms at 410 cycles per second. Weight 1.45 lb. for 120 watts. MIL-M-12905 for motors.



Type 3-5010 Power Package. Size: 7.5" x 4.5" x 2.1". Weight: 24.0 lbs. 0.75 hp rated at 1000 rpm. Static load: 10 lb. Dynamic load: 1.25 lb. Rate of travel: 3.75 per second. Response: 3.0 ms at 410 cycles per second. MIL-M-12905 for actuators. MIL-M-12905 for motors.



Type 3-5020 Rotary Actuator. Weight: 5.0 lb. Power: 200 watt, 400 cycles per second. Response: 3.0 ms at 410 cycles per second. Static load: 1.25 lb. Dynamic load: 1.25 lb. Rate of travel: 3.75 per second. Response: 3.0 ms at 410 cycles per second. MIL-M-12905 for actuators. MIL-M-12905 for motors.

Type 3-4020 Differential Gear Actuator. Weight 1.5 lb. MIL-STD-129. Operating load: 600 lbs. MIL-STD-129. Static load: 7150 lbs. MIL-STD-129. Speed of travel: 3.75 per second. Response: 3.0 ms at 410 cycles per second. MIL-M-12905 for actuators. MIL-M-12905 for motors.

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### Nike Warhead Price

Aeroso wished for the Nike Hercules missile now in the marketplace of \$3,000,000. Nike Hercules warhead cost about \$17,000 for average quality warheads. Hercules should not be much more expensive in quantity. Five different missile warheads of varying yield are available to Hercules firing batteries.

### Skin-Forming Machine Developed for Titan

In Segrate, Italy—Hoffeld Corp. last week demonstrated its liquid metal skin-forming machine developed especially for the second stage of Martin's Titan intercontinental ballistic missile. Machine has now undergone proof tests at Lockheed and will be shipped to Martin's Denver plant later.

In ICBMs, two approaches have been used satisfactorily. Convair's Atlas uses thin skin with prethinning replacing expanded fuel and reduces to actual structure's shape, rigidity and weight while Titan uses thicker pre-thin skin after skin integrally reinforced, then an integral tank configuration.

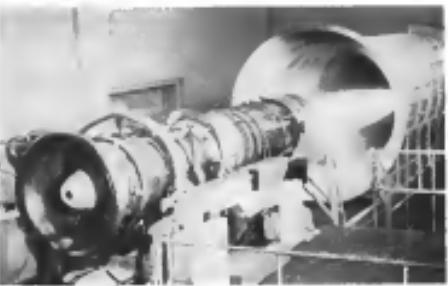
The Hoffeld machine takes pre-thin extruded by Alcan and Hexcel. Also known as the "hot wire" machine, it uses a 14 x 10 in. cross section, while Alcan's panel is 34 x 280 in. Both panels are 2014 alloy, in the T8 condition, 30,000 psi yield, 57,000 psi ultimate tensile tensile strength. Ultrasonic inspection is accomplished by flaw detection.

In Hoffeld processing, surface roughing is done first, reducing the panel's surface to 80 psi at 1000 rpm. High roller band rotational speed plus dies force longitudinal yield line insertion from V-groove thickness control is made and post-tensioning is used to check.

Panel is lowered to a film station, insulating a single character of 10 ft. After the panel is inserted in the machine, sides are gripped and lower die pushes up to give the proper curvature. Die corresponds slots for the structure. Machine end jaws then move to grip the panel and a stretch to 4% original length is imposed to set the curvature and prevent buckling rather than extend panel length. Styrene also tends to relieve stress imposed in curve forming.

Panels are tempered, heat treated and aged to 76 condition with 57,000 psi yield and 64,000 psi ultimate tensile.

The panels are then cleaned earlier to the final thickness, which is 0.70 plus or minus 0.05 for regular sections. And on the extreme surface of the skin, a



### British Olympus 101 Undergoes Test

Solar afterburner will enable three of this British Olympus 101 turboprop for Avro's Vixen to be used in the supersonic range. The afterburner is being developed to keep afterburner. Afterburner thrust increased can be varied from zero to about 40% under take-off conditions and has been tested through this range on the stand. Afterburner is expected to be fitted on a later model Olympus turboprop for a new aircraft project. Specification is that project is a British research aircraft designed for supersonic flight above Mach 2.5.

exterior panels are separated between the stiffeners, with marginal thickness less being 0.05 plus or minus 0.05.

Panels are butt welded, 12 forming a circumferential, and several in the ring, using lengths making up the longitudinal length portion of the missile. Each panel has three stiffeners in T-form with flange approximately 0.75 in. thick, away from skin, and web thickness appears roughly 0.32. Stiffener web is approximately 1.1 in. high from skin junction to bottom flange, while the flange is approximately 0.3 in. wide.

The structural stiffeners on the exterior do not have the full panel length, and are located inner and outer than the other after final trim. Pockets are allowed as wide as seven between two stiffeners, with taper at each end and rounded ends similar to a blunt nose shape with very taper about of it.

Blank skin undergo final check, then are shipped to Denver.

### News Digest

Avin Aircraft Ltd. will roll out the CD 105 Avin Avion, following refit of Oct. 4 at Melsztyn, Avin, Poland.

Construction of Breguet Aviation Corp. rapid transit train began last week at Toulouse. One train will cover the 100-mile route, a second will go up to Mach 4. Facility, costing \$1,200,000, is of blow down type.

### RAAF Orders C-130s

Austral. Govt. has placed order in excess of \$35 million with Lockheed Aircraft Corp. for 12 C-130 Hercules cargo transports, including options, new taking and support equipment.

Delivery of the 62 ton cargo aircraft will begin in October 1966. Prototypes, which are scheduled to fly in early 1967, will undergo flight testing and evaluation directly from the production line at Marietta, Ga.

# CAB Fare Decision Draws IATA Fire

Statement reiterating CAB stand against fare hike raises ire of delegates to annual IATA meeting.

By L. Doty

*Middle International Air Transport Assn.* chairman of Civil Aviation Board's stand against any fare increase was sharply re-enforced during the closing sessions of the 12th annual meeting here by the release of a CAB statement reaffirming its position.

The statement, drafted to the IATA traffic conference which meets tomorrow in Miami, was termed "unjust" and drew a suggestion from one delegate that U.S. carriers may be acting in collusion with the Board in blocking a fare increase. In the event, however, that representatives of the U.S. airlines were evenly divided by the CAB's reaffirmation of its fare position at that time.

## Why Disapproving

The Board, in its statement, made public during the meeting, declared that:

There is no economic justification at this time for adjustments which would result in an increase in the overall revenue yield presently accruing to the airline from operations on the North Atlantic. It added that the Board "cannot see any need for a change in the basic fare levels now in effect on the North, South and Mid-Atlantic routes."

The Board emphasized at first "the currently effective fare levels to be inappropriate for the various classes of service now being offered." It added that, in upgrading disapprovals the 5% fare increase proposed by IATA, it pointed out that "the increases paid by the carriers for supplies, etc., have not been taken into consideration in the cost incurred in providing this service."

It said it strongly supported the three-tier fare level agreed upon by IATA members to become effective April 1, 1958 and added:

That fare will prevail, under sound conditions of service, the off-setting of a tier will reflectively affective with respect to both quality of the service and cost to the passenger, to develop the potential market while at the same time, affording the carriers an adequate revenue return."

Picking against the CAB statement was high among the delegates during the final hours of the annual meeting

get it agreed to pay a 25% premium on air transportation because of this difference and that a fare increase would only serve to exacerbate the disparity.

In this connection, the executive committee of IATA announced during the meeting that it had proposed a currency exchange rates in marking its fare and rates have been drafted. The committee said the proposed "upper limit simpler" fare payment regulations and, if accepted, will use ratios of a number of currencies in the ratios. The plan would, in some cases, restrict the payment of fares to specific carriers in particular areas.

**Four Increases Advocates**

European and U.S. carriers were the strongest advocates of a fare increase during the meeting and maintained the immediate need for high revenue yields in the wake of substantial increasing costs being experienced by most carriers.

International traffic control by European members will result in the international traffic carried by the Asian members. Thus paid IATA by European and Middle East airlines as well as for more than the total debt.

Gen. Georges Puyet, administrator general manager of Compagnie de Transport Aérien International, said: "Airline Wires" Wires, that the air traffic control system should be reorganized to cover most of the non-DC-9s and DC-10s. The French carrier has endorsed other European carriers' revised fare's rates.

Speaking for British European Airways, Lord Douglas of Kirkcudbright, acting IATA president, urged the CAB action in blocking the fare increase is "just" and underscored the capital requirements of aviation in equipping for the future.

The conference also is expected to adopt a no-show penalty plan similar to that adopted by the domestic carriers to put an end to recoverable fares to increase traffic upon continents. It will also be voted to reduce the complexity of the international passenger fare structure and steps will be taken to eliminate present deficiencies in the rating system governing freight and cargo shipments.

The executive committee sensed that the recent CAB order precluding U.S. carriers members of IATA from being bound by IATA resolutions has "serious implications." The CAB decision, which originally came from a complaint filed by a non-DC-10 carrier, pertains to IATA members U.S. carriers involved with in a dispute U.S. regional of the international transportation covered by the regulation in question.

In its release of the CAB, the executive committee told the conference

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IATA delegates at 12th annual general meeting. Middle, we welcome by 1957-58 association president Thomas Delgado, of Cuban Airlines (left); Raking president Lord Douglas of Kirkcudbright, British European Airways head, speaks at opening session (right).

that "the situation will require to be watched" and solved.

While the committee said of members has so far located the possible consequences of the CAB's action, the adoption of the principle inherent in the CAB order by other governments could lead to the complete understanding of the IATA fare structure.

The committee explained that under the CAB plan, IATA members must be compensated for any fare increase or decrease, except at through fares arrived at by a combination of domestic and non-IATA international fares that could finally reflect fares agreed upon in the IATA traffic conference.

The executive committee also believed the structure of fares to the high cost of IATA's enforcement penalties. Admitting that enforcement is "an absolute necessity," the committee said \$211,000 of the 1958 IATA budget of \$2,290,000 is allocated for enforcement activities.

## New Treaty?

The legal committee warned delegates that a new international treaty may be required to simplify the charters and interchange of aircraft in order to obtain maximum utilization of high-cost equipment.

The committee concluded that the Change committee "instincts a framework that should permit the handling of leases without crew, as well as leases with crew, whether on a term basis, a voyage basis or an otherwise."

Although the committee agreed that certain changes are necessary in the structure of the treaty, members of the committee concluded that a revision of the IATA charter is not required.

The committee said, however, that difficulties may arise in the use of the term of aircraft with crew to an entity other than an airline. The committee

suggested that, when such a lease involved the carriage of passengers, any guarantee as to the liability of the airline as a lessor could be settled by making upon the issuance of tickets in passengers carried under a charter agreement. Such a procedure would automatically put the transportation under the rule of the Warsaw Convention which establishes liability limits.

## Cargo Leases

Leases of aircraft with crew for the transportation of cargo pose a different problem, the committee said. With cargo, the shipper would hold the airway bill of the lessor or forwarder and not those of the lessor's airline.

As a result, the owner of the aircraft could not have the protection of the Warsaw Convention liability limits which he held when carrying cargo under his own airway bill and could, therefore, be liable to rent and without limitation. Under the committee's suggestion, the committee recommended the supplement to the Warsaw Convention that the liability of the lessor for the carriage of cargo under a charter contract cannot be retroactively reduced under the present convention.

The IATA legal committee also called for the simplification of a committee on aerial collisions.

## ICAO Proposals

The group supported recommendations of the International Civil Aviation Organization's air transport committee proposing that the liability of each contracting state for damage caused by aircraft under its control should not exceed \$100,000.

• Twice the limits of the Warsaw Convention established for passengers, crew, registered baggage and goods and personal property.

• Market value placed on aircraft involved in a collision immediately prior to the collision.

The legal committee also reiterated IATA's stand on the legal status of the

aircraft and the aircraft commander that there is no legal necessity for a committee to discuss the authority of the pilot in command in relation to offenses committed in aircraft in international flight.

Passenger fares by IATA members in scheduled air service showed a 10% increase between 1949 and 1958. Revenue passenger-kilometers jumped 22.7% during the same period. In its latest financial report, the association said revenues had risen 10.4% and fares 6.4% for 1958, as compared with 6.9% in 1949. Higher load factor was reached in 1951 when 65.4% was recorded.

## Passenger Average

Average passenger per aircraft in 1958 amounted to 316 and average seat per aircraft, 49.5. Average trip was 1,067 kilometers.

Number of employees service with IATA member airlines totaled 304,000 last year and the operating fleet of the carriers was 2,790 aircraft.

## Czech Airline to Use Tu-104s on Arab Run

Venice-Czechoslovakia's monopoly airline's transport department in mid-July said that the Soviet Union has agreed to let Czechoslovakia buy the first three Soviet Tu-104s. The air craft are to be delivered to Prague this fall.

The CTK airline will use them each on Prague to Cairo route, and Prague to Beirut and Damascus. The new fleet will start operating in November.

• The Tu-104 flight will be made by Prague to Moscow route will also be flown, flight time to be 2 hours 75 minutes. Czechoslovakia has routes in 14 countries, will have 19 countries to do so because of at end of this year.

## ACC Details Future Traffic Needs

Washington—Air Carrier Traffic Control Center has issued that amended and distance measuring capabilities of Vortac will be required for air traffic control and ground separation of aircraft by at least 1965.

In a paper approved by the Air Traffic Control and Navigation Panel, the ACC said the air traffic control system must be based on Vortac facilities and that all aircraft operating under IFR and VFR subject to positive separation must be equipped with both distance measuring and azimuth capability "as soon as possible."

Aircraft which are not intended for use in either IFR or VFR flight under present control will not be required to meet the Vortac standards, the panel said.

At the time of the date of issue, 1965 was set for by the ACC to establishing the distance measuring portion of Vortac on a system basis. However, the panel stressed the urgency of the need for implementation of the Vortac system is stating that the target date "should be the earliest practical date which can be met."

The panel and several minimum spacing between successive Vortac facilities serving basic route structures should be 76.16 miles. A maximum spacing of 136.31 miles should be re-

quired in selecting Vortac facilities to define and provide service on intrastate altitude route altitudes. On Fig. 1, the basic route vertical spacing of 31.07 miles should be considered, the ACC stated.

The report, entitled "Minimum System Operational Requirements for Vortac," was approved by the air traffic control and navigation panel acting on behalf of the ACC with the Civil Aeronautics Board abstaining.

## Brazilian Line to Add Engine Overhaul Unit

Rego Air Interim-Poer do Brasil has sought authorizing interests of a new aircraft base which it will convert into a special division to handle engine reworking and maintenance.

Poer expects to set up 51 aircraft available to using the new facilities which will service L-49, DC-7C and later jet aircraft, probably for Douglas DC-8s. The plant will eventually serve other vehicles in engine work. Local engine reworking facilities to date have been restricted to DC-3 and lightplane engine jobs.

Other parts for the shop will be manufactured locally, but big components still will be imported. Since

local production of components is expected later as Brazil enlarges its base dry and metalworking industries.

Poer do Brasil is partly owned by Pan American World Airways.

## Northeast Inaugurates Capital-Miami Run

Washington—Northeast Airlines, a regional carrier that has given into a major headache within the past year, was inaugurating a new charter service last week between Washington and Miami. Service to Jacksonville and St. Petersburg, Clearwater will be added later.

Douglas DC-6Bs equipped with radio and featuring a "quiet" cabin setting are being used on the daily round flight. Flight time is about 1 hr. 35 min.

Northeast transferred to Washington last November. It moved the non-priority New York-Miami flight on Jan. 1, Philadelphia-Miami service was started Aug. 1 and New York-Tampa service Aug. 30.

## New Electra Orders Raise Sales to 135

Lockheed Aircraft Corp. has made the first Electra sale to a U. S. lessor and has contracts with an order from Pan American Airways for three of the turboprop. Price with options is \$8 million.

Delivery and delivery is scheduled for November and December, 1964.

The sale is the first that is to Cuthbertson, Inc., of Atlanta, Ga. Delivery will be to the plant to 135. Last previous Electra order, covering four for Canadian International Airways, was announced in April.

Lockheed says no exact breakdown point for the price has been established, but that it probably is within the \$200-250 unit range.

Pacific Southwest plans to use its Electra in service between San Diego, Los Angeles and San Francisco. The aerospace carrier expects flight time from San Diego to San Francisco to be 71 min., with the turboprop.

## Allison 501 Approved To Power Electras

Washington—Civil Aeronautics Administration last week announced the certification of the Allison 501 D65 turboprop engine for use on the Lockheed Electra transport.

Last month, CAA approved the Aeroproducts 806 liquid-cooled propjet engine with which the 1,370 hp engine will be equipped. Price to certification is \$1,000,000. The engine has 10,000 hours of development time on test stands, 75,000 hours of experimental and service flight time and an additional 50,000 hours of testing of engine components.

## In-Flight Phone Service Installed

Direct integrated radiotelephone service, which enables flight passengers to be connected to any telephone in the station or receive calls from any telephone, has gone into service on an experimental basis in the Chicago-Detroit area. If the current working feasibility tests prove successful, and sufficient channels in the crowded radio spectrum can be found, busy executives may find no trouble from office problems in about as another coming 25,000 units.

In current tests, conducted by The Allis-Chalmers Michigan Div. Telephone Companies, 11 airports and one government aircraft have been equipped with high-noise two-way radio telephone equipment. When a passenger in one of these aircraft pushes a push-talk button on his telephone, telephone, he quickly finds himself talking to a "remote call station operator" on the ground, given his plane's name as identifier.

Rate for the one-way trial service depends upon location of the aircraft and the path on the ground. For example, a call between an airplane over Milwaukee and a telephone in Chicago will cost \$1.40 for the first three minutes. A call between a plane over Cleveland and a Chicago phone would be \$2.15 for the first three minutes.

Airborne radio transmitters-receivers being used in the test have been supplied by A. G. Sperry, Div. Division of General Motors and Matroska Broadcast Radio and Radio Corporation of America. Tests are expected to supply units for subsequent tests.

## ATA Official Says CRAFT Threatened

Arlingtton, N. J.—President of the nation's Civil Reserve Air Fleet is hoping to avoid the "certain disaster" now at work, according to Turner, vice president of traffic Air Transport Association, last week.

In a speech before the American Legion National Aeronautics Committee, Turner said the subcommittee: "• Threat of government in duplicating and paralleling routes being operated by the scheduled airlines.

• Threat of continuously rising costs of airline operations and revision recompensation programs, which, under what Turner termed the present legislation, allows as much as 100 percent less revenue than the first three years.

• Threat of increased foreign government policies that is virtually "locking away" seats, routes and vital traffic areas to foreign airlines in direct competition with U. S. flag carriers.

• Threat of Soviet Russia which al-



Two of America's first jet aircraft are moving along assembly lines in the West Coast plants of Boeing Airplane Co. and Douglas Aircraft Co. Boeing 707, at right on next page, is moving completion, its engines and tail sections already installed. Plans will be met to set the cost, delivered to Pan American in late 1965. Above, Douglas workers at Long Beach plant factory of DC-8. Length of the fuselage is 98 ft. diameter is 12 ft. 3 in.

## Boeing, Douglas Readyng First Jets for Airlines



AVIATION WEEK, September 23, 1957

Progress with TITANIUM



J-47 compressor entry opening at several hundred degrees F., note discs, blades and other parts of M&S 645-4V titanium alloy.

## MORE THRUST PER POUND

**Teamwork of specialists applies titanium alloy  
to improve mightiest U.S. jet engines**

The bold use of new materials is one of the reasons for the performance of Pratt & Whitney Aircraft's J-53, and newer J-75 jet engines.

The M&S 645-4V titanium alloy, which Mallory-Sharon helped develop and introduced commercially, is used in quantities of hundreds of pounds to increase the thrust-per-weight ratio of these engines. The alloy meets the rugged conditions of stress and temperature in engine use.

Mallory-Sharon, one of the first

material specialists for the engine, supplies the M&S 645-4V alloy to various specialists for fabrication . . . Leder Co. and Wyman-Gordon Co. for spacer and disc forgings . . . Thompson Products, Inc., Eakon Manufacturing Co., Steel Improvement & Forging Co. for blades and other parts . . . which are all fur-

med to Pratt & Whitney Aircraft

Let Mallory-Sharon, technical leader in titanium, help you apply this new metal. It has the strength and lightness needed in engines and aircraft, the superior corrosion resistance demanded for aircraft processing equipment. Write for information.

**MALLORY**  **SHARON**

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such as the only nation in the world operating jet fighters on a scheduled basis and even dry is becoming a stronger competitor for the world's air passenger traffic.

Forces said, that, if these forces continue to grow, they can double the tonnage and capability of the air transport industry to do the right kind of job if it is needed in an emergency. "They certainly can run havoc with any program," he said, "and this can weaken the link of civil air transport in the air power chain."

The government is in the air transportation business with part of its Mission, Air Transport Service, Tansair and Monstar. He added that the government must increase its role in the Defense Department, have recommended that part of MATS transport operations be turned over to the civil airways.

This would encourage the industry to continue their re-equipment and modernization programs and at the same time save the government money, because civil air transport in these specific areas is known to be cheaper than military air transport. Moreover, use of the airlines would relieve military personnel and funds for civilian organizations such as those serving for shared purposes," Tansair said.

With regard to the economic status of the regional airlines, Tansair told the group, a situation exists which an industry is literally "unthinkable" at the moment.

The first is more than 22% of industry not operating income in the past 10 years; he has never had, but has just re-equipment programs to bring the public the best possible service. And, the cost of everything the airlines has and can, gasoline, aircraft, personnel, operating facilities, in the past 10 years has gone up in a alarming rate. But, he added, "the time the airlines change their parangons have remained almost level."

In fact, air transportation on the average costs less per mile today than it did in 1938.

Tansair charged the government with ensuring a role of "The Rich Uncle" toward foreign countries is allowing the foreign flag carriers to build up their airlines and practice the traffic areas of the U.S. at the expense of U.S. carriers.

The Korean government, that borders North Korea, "Tansair said, "has not been as economical or bold as we would like for the future in the areas we are building. But we don't have any U.S. built jet aircraft flying in scheduled operations. The Russians do and have had for more than a year. And they already have announced newer and improved versions of the Tu 104 and a much larger transport, the Tu-410. Certainly, they know better."



**GLOBAL** Map of the new Northwest Orient Airlines and Trans World Airlines service will be at Miami.

## Northwest, Trans World Plan Globe-Circling Service for Jan. 1

Washington—Two U.S. air transportation carriers, Trans World Airlines and Northwest Orient Airlines will join efforts to organize a new around the world air route beginning Nov. 1963.

A TWA Lockheed Jetmaster and a Northwest Douglas DC-10 will take off from New York on Jan. 1 and land in Tokyo after 10 hours but both will have to make stops elsewhere to build up their airways and practice the traffic areas of the U.S. at the expense of U.S. carriers.

The Korean government, that borders North Korea, "Tansair said, "has not been as economical or bold as we would like for the future in the areas we are building. But we don't have any U.S. built jet aircraft flying in scheduled operations. The Russians do and have had for more than a year. And they already have announced newer and improved versions of the Tu 104 and a much larger transport, the Tu-410. Certainly, they know better."

The two carriers will offer connecting services in Manila.

Northwest provides daily flights from New York to Tokyo and three flights weekly from Tokyo to Manila. TWA schedules daily flights to Rome and Athens and will schedule two flights weekly on to Manila.

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short, medium and  
long range  
airliners

Rolls-Royce have over 3,000,000 hours  
experience in the operation of gas turbine  
engines in scheduled airline service



## SHORTLINES

► Northwest Airlines is scheduled to begin nonstop New York-Seattle and New York-Pittsburgh services using Douglas DC-7Cs. The flights will be operated as mixed passenger-cargo charter. Northwest has taken delivery of seven of 34 DC-7Cs on order. The remaining seven will be delivered by the end of next April.

► Gae Foster Parsons of Massachusetts has signed a bill authorizing a loan issue of \$155 million for construction of four hangars and an air freight terminal at Logan International Airport in Boston. Negotiations for the loan of the state money, which is half the capitalization for a 25 year term, will be handled by the State Airport Management Board. There will be provisions for general state, municipalities, reversion on the unexpired balance and seven years. Hangars will be constructed for Eastern, Northeast, Northwest and Trans World Airlines. The freight terminal for American One state official estimates that the facility will bring in annual profits of \$235,000.

► KLM, Royal Dutch Airlines, will begin nonstop service from New York to Mexico City on Oct. 11. In 1958 KLM made over 1,000 landings in Mexico, carrying some 130,000 passengers through the inland airport.

► North Central Airlines earned \$7,458,000 in August, a record for the fiscal year to date. The airline flew more than 510,000 miles over routes totaling 1,240 miles. North Central also set a daily local service record by carrying a total of 2,626 passengers on Aug. 16.

► Frontier Airlines established passenger records in August by carrying 22,900 passengers, 3,030,000 passenger-miles, an increase of 21% in both categories over 1956.

► Chicago Helicopter Airlines carried 1,140 passengers between Midway-O'Hare airports and the Chicago Loop, May 30, in August for a company record. So far this year the airline has carried 38,295 passengers.

► Los Angeles International Airport handled 2,150,615 passengers during the first six months of 1957. The figure represents an increase in passenger handling of 16.7%. In the first six months, the airport also handled 19,504,237 lbs. of air freight, 31,416,584 lbs. of air express, and 28,750,205 lbs. of air mail.

## AIRLINE OBSERVER

(The following column was written by Aviation Week Transport Editor E. L. Doty while attending the 11th Annual General Meeting of the International Air Transport Association in Madrid.)

► Japan Air Lines plans to introduce the first of four DC-7Cs on order in March or April between Tokyo and San Francisco. JAL also has four DC-5 jet transports on order and expects to receive its jet fleet to a total of eight during the next 10 years. Seventy-five per cent of the financing program for DC-7s and DC-8s is being handled through the Export Import Bank.

► Aeroflot, Soviet-owned airline, was not represented at the International Air Transport Association general meeting although a Russian representative was present at last year's meeting in Edinburgh as the result of an invitation extended by Lord Douglas of Northcote, then president of the association. No formal invitation was extended to the Russians this year. However, Sir William Hinchliffe, IATA director general, said that, if Aeroflot indicates its desire to join IATA, it will be "welcomed."

► Carter Burges, president of Trans World Airlines, was so impressed with the airline's international division during a recent visit to Paris, Zurich, Milan, Rome, Madrid, Lisbon and the Azores that he will participate directly in operations on standards established by the international sector. Burges also may support European ships as an effort to improve quality of in-flight service on domestic routes.

► British Overseas Airways Corp. will introduce turbojet Brancker H2s on its North Atlantic route during the first three months of 1959. First of the long-range aircraft will be delivered earlier this month. Lack of forward planes in the sector for delivery in conjunction of insufficient take-off service which the airline had hoped to begin this fall (AWW Jan. 21, p. 16). One plane has been taken by British as the nucleus of the airline's flight training program on the H2s.

► Air France Ltd., a British organization, has extended a loan of approximately \$5 million to El Al Israel Airlines to help finance the purchase of three Britannia turboprop transports. The airline has been seeking funding except for some time now the Israeli government has been unable to offer financial aid.

► Trans World Airlines has asked the legislature in Spain to consider the nickname "Tow-oo-W" to identify the airline and as an assist to Spaniards who would otherwise have difficulty in pronouncing the "W." The promotion backing the introduction of the nickname has been so successful that "Tow-oo-W" spoken to the telephone operator will automatically connect you with TWA and sub drivers need no other address when told "Tow-oo-W."

► Middle East Airlines has begun a once-a-week all-cargo service on its two routes from London to Beirut via Miles and from London to Saïda, Beirut and Beirut.

► Cathay Pacific Airlines has ordered two Lockheed Electra turboprop transports for delivery in June and August of 1959. Cathay Pacific with headquarters in Hong Kong will operate the turboprop throughout its major routes in the Far East.

► International Air Transport Asia will hold its 9th annual general meeting in New Delhi, India, where J. R. D. Tata of Air India International will take over as IATA president for the 1958-59 term. Meeting will be held in Tokyo in 1959. Date of the New Delhi session has been set for October 10th and September 11th because of the monsoon late-weather conditions to early fall.

► Vote to transfer IATA headquarters from Montreal to Geneva was 30 to 29 in favor of the move with six members abstaining, but because of the small majority, the resolution was withdrawn by a European bloc of seven airlines which had sponsored the proposal.

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WEAR RESISTANCE PROVIDED BY  
FLAME-PLATING BY LINDE



Linde's FLAME-Plated, newest weapon of the Air Force, is the most advanced means of protecting aircraft parts from wear, abrasion, and fatigue. Flame-Plating is unique in its ability to increase efficiency, lowering operating expenses of hot air valves and in the F-100s on El��et Flame with unique carbide. Flame-Plating parts are wear-resistant, corrosion-resistant, and heat-resistant, and are designed to withstand the heat and bearing and insulation stresses of jet plane parts uniformly.

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Flame-Plating is Linde's special process for protecting metal parts from wear, abrasion, and fatigue corrosion. Tiny particles of tungsten carbide or aluminum oxide are literally blasted onto the metal surface. Since the temperature of the part being coated seldom exceeds 500 degrees F., there is little or no change in its shape or metallurgical properties. Flame-Plated coatings can be coated from .002 to .010 inches thick, and can be coated or treated to 0.5 microinch rms. Practically all metals can be Flame-Plated—aluminum, magnesium, molybdenum, titanium as well as copper and nickel.

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## Airline Traffic — July, 1957

	Revenue Passenger Miles (1956)	Revenue Passenger Miles (1955)	Ahead Past	U. S. Mail	Expense	Freight	Total Revenue Per-Mile	Per-Cent Increase in Aviation Per-Mile
<b>DOMESTIC TRAFFIC</b>								
Aviation	834,148	842,457	42 +	8,320,319	370,284	4,194,728	13,427,322	16.4
Airline	844,132	74,448	97 +	347,349	86,711	4,182,807	7,474,071	62.1
Capital	241,363	120,000	98 +	439,318	181,712	434,375	19,437,618	65.7
Commercial	7,722	37,700	39 +	76,743	15,742	1,371,749	1,000,000	17.4
Domestic	234,097	136,518	89 +	320,738	180,186	793,226	15,365,240	33.4
Excess	644,219	555,458	61 +	819,615	360,580	1,683,637	56,840,936	62.38
Marine	714,427	72,338	64 +	345,149	41,704	481,150	2,126,359	63.6
Marine	22,000	22,000	7 +	26,250	2,250	2,250	28,500	5.0
Mountain	394,641	92,043	62 +	399,413	166,623	229,382	18,318,372	24.2
Texas World	415,136	67,015	71 +	914,380	637,381	2,273,387	86,226,018	42.2
United	278,104	427,518	49 +	8,173,451	834,553	5,989,579	91,444,519	58.6
Western	124,719	42,120	81 +	349,269	73,002	249,269	5,412,710	17.4
<b>INTERNATIONAL</b>								
American	15,270	16,063	48 +	16,251	584	166,180	1,366,997	16.4
British	4,244	7,209	32 +	12,717	10,107	1,075,000	1,275,199	48.8
Caribbean-Bahamas	17,745	5,187	41 +	1,320	3,491	177,179	16,055	6.0
China	4,353	8,110	60 +	8,626	2,027	803,410	82,410	42.8
Europe	25,585	47,700	75 +	41,523	4,000	4,000,000	42,500	42.0
General	1,100	1,100	1 +	1,277	1,277	1,277	1,277	0.9
Mountain	17,343	27,160	68 +	923,411	16,211	865,723	2,452,118	52.7
Peru	7,472	7,443	2 +	48,344	1,421	1,421	1,421	0.0
Alaska	112,764	126,102	66 +	177,219	2,209,000	18,404,140	18,404,140	45.9
Argentina	186,445	146,408	54 +	286,249	2,065,111	2,065,111	2,065,111	77.8
China	197,495	191,216	79 +	916,910	1,184,367	18,404,411	18,404,411	47.8
Europe	1,100	1,100	1 +	1,179	1,179	1,179	1,179	0.0
General	22,181	16,120	64 +	720,372	720,372	720,372	1,492,394	44.0
India	22,181	20,000	70 +	96,042	84,381	84,381	3,107,026	70.3
United	11,481	20,000	70 +	96,042	16,211	16,211	16,211	0.0
<b>LOCAL SERVICE</b>								
Alaska	42,074	7,727	38 +	8,339	12,657	11,723	774,384	42.4
Alaska	15,431	3,648	41 +	2,376	1,303	7,210	18,048,040	50.9
Central	11,455	8,197	94 +	4,243	8,223	8,223	4,456,470	50.9
China	1,411	2,479	39 +	15,441	7,472	7,472	14,943	44.0
Local Control	12,053	2,279	24 +	3,084	12,310	12,310	12,310	26.0
Maharashtra	41,744	18,351	47 +	21,456	17,447	17,447	1,118,152	47.2
North Central	7,195	7,195	1 +	11,155	10,754	10,754	10,754	0.0
Other	3,175	3,175	1 +	11,155	10,754	10,754	10,754	0.0
Piedmont	27,416	7,372	38 +	12,493	7,771	14,284	776,411	57.4
Seattle	18,412	3,328	38 +	8,842	9,931	9,931	30,328	28.2
Seattle	9,436	9,436	93 +	7,444	9,436	9,436	14,829	52.2
Texas	22,460	12,179	93 +	18,456	20,193	20,193	18,456	44.0
West Coast	34,843	4,127	21 +	6,479	2,372	2,372	6,479,178	48.45
<b>MANUFACTURE</b>								
Alaska	43,934	7,004	91 +	3,387	741,179	750,046	42.2	
Trans-Pacific	99,380	8,109	41 +	1,191	11,789	956,440	48.8	
<b>CABLES &amp; CABLES</b>								
Americas and Australia	53,627	64,340	97 +	20,746	10,388	182,464	482,464	37.8
Flying Tiger	10,407	10,407	1 +	10,407	10,407	10,407	10,407,000	0.0
India	7,712	22,298	198 +	1,489,997	1,489,997	1,489,997	8,446,708	91.4
International	7,712	22,162	92 +	7,810	22,334	4,368,826	7,497,521	82.13
<b>OFFICE OPERA</b>								
Chinese Relocations	5,481	84,0	21 +	2,480	1,031	1,031	15,314	39.3
Los Angeles Airports	3,983	126	92 +	6,030	2,071	5,908	45,305	66.72
New York Airports	9,156	168	49 +	7,849	994	4,118	19,315	48.6
<b>ALASKA</b>								
Alaska Airlines	4,341	1,707	48 +	30,048	1,031	3,686,847	44.4	
Alaska Central	4,051	508	65 +	9,497	1,031	5,455,305	48.8	
Central	19,745	2,048	32 +	2,481	1,793,077	2,345,822	49.8	
East	1,102	1,102	1 +	2,481	1,031	2,481	2,481	0.0
Public Airways	19,164	12,077	66 +	10,057	5,194	5,194	18,178,195	48.7

\*Not available  
Compiled by AVIATION WEEK from airline reports to the Civil Aeronautics Board.





## Photographing Super Sabre Loop

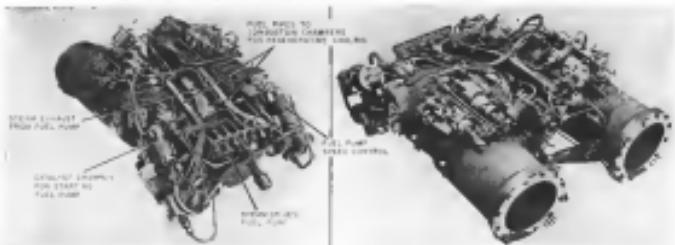
THIS SEQUENCE of the supersonic North American F-100D in a full loop was made by North American Staff Photographer Gene Bowell. Bowell used a Graflex K-20 sequence serial camera on Super X film. Exposure was 1/100 sec at shutter speed of 1/10. Distance between camera and plane of the TF-56 photo plane. Stars indicate position at which each exposure was made. At point where the photo plane was passing 90° to the 20° camera weighed 55 lb. Loop was flown just off the coast of South Barbara, Calif.



**INSTRUCTIONS** Test Pilot Zeke Hopkins flew the F-100D (above) during the loop photographing maneuver. Gene Bowell (below) demonstrates the desired maneuver for the loop pattern to Capt. Pat Hanowski, at right, and Hopkins. Capt. Hanowski is a USAF test pilot, flew the TF-56 Sabre photo plane. For best air-to-air photo setup, Bowell says, distance between aircraft should be 75 to 100 ft. Cap. with tail 125 ft at about station



# AERONAUTICAL ENGINEERING



**HAWKER SIDDELEY** two-bore outlet package consists for two outboard combustion chambers.

## British Emphasize Reversers, Silencers

By David A. Anderton

Perthshire-Miles thrust nozzle quickly and possibly reversed was the dominant theme of the engine display at the 13th Society of British Aircraft Constructors exhibition.

### New Powerplants

Half a dozen new powerplants shown for the first time included:

- Two 1,000-shp gas turbine engines developed in power versions by Armstrong Siddeley Motors, Ltd.
- Bristol Centaur supersonic turbo prop rated at 5,250 shp for takeoff and completely coated in a protective anti-corrosion paint.
- Rolls-Royce RB 105 turbogear with extremely high thrust/weight ratio, developed from the aircraft concept in the Short S.1.
- Diversified in the displays as well as on the stands were:

• Thrust reverser by Rolls-Royce designed for the Avro RA 29 turbogear for de Havilland's Comet IV.

• Canopy-mounted nozzle assist reduction unit also by Rolls-Royce. Now a production item for the RA 29 installed in the Comet IV.

• Exhaust silencer developed by Armstrong Siddeley Motors, Ltd. for the Olympus engine now producing the Avro Vulcan bomber and shown on the Olympus Gannet flying test bed.

Both silencing units and the thrust reverser impressed observers with the apparent efficiency of their operation.

The RA 29 Avro engine, which uses a single-stage compressor, whenever possible to get down on development time and cost, features

here a two-stage centrifugal compressor driven by a two-stage turbine, plus a single-stage power turbine driving either a static shaft or a propeller

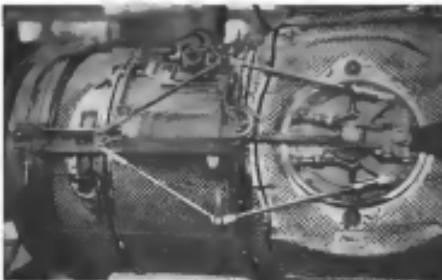
either a static reduction gear

or a Canadair shoulder design at the discretion of both.

The P. 182 engine, for fixed-wing applications, develops 3,075 shp, and Armstrong Siddeley Sparta jet conversion is down to 0.657 lb per



**ROLLS-ROYCE** thrust reverser directs exhaust gases through baffle springs. Activation arm shown with discus fully opening (middle)



in normal position (left).

shp per lb and the specific weight is 0.44 lb per shp. Maximum engine diameter is 30 in.

The P. 181 has been developed to drive the wing aerofoil fuel system at 95 shp, develop fuel consumption at a higher 1,875 shp per shp, per hr, and specific weight is 0.59 lb/shp. Engine diameter is also 30 in.

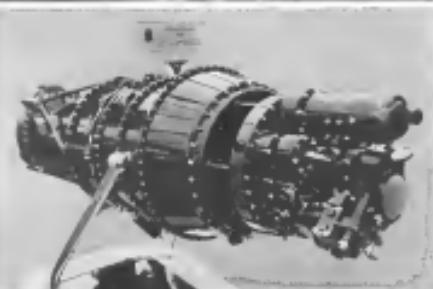
### Reverser for Transport

Rolls-Royce says its thrust reverser has been designed to fit on the Avro for DH Comet IV's and on the Concorde for the Boeing 747. No weight, costs, or thrust figures will be quoted by the company, but they can claim a saving of 10 per cent. The reverse consists of a pair of nozzles which fit flush against the walls of the engine nacelle when not in use, and which clamp together when thrust reversal is desired. The closed nozzle directs the thrust exhaust blast out through slots at a forward angle. Slots can be strengthened and angled to avoid blowing the heated gases on sensitive portions of the aircraft.

The conceptual silencer nozzle developed for the Avro is based on the idea of Rolls engineer F. B. Gurnell, who pioneered the idea of nozzle which terminated properly in a silencing tube.

The silencer unit consists of six small triangular baffle rings inside the tail pipe. The area is distributed to take the place of the propelling nozzle at the end of the tailpipe. Cooling air from the free stream is pumped through annular holes by the spinous action of the exhaust.

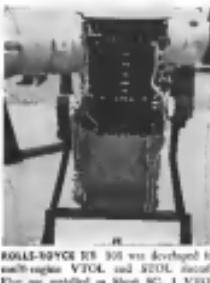
Now on the Comet III, these silencers are proved that jet engines can be quieted. Gurnell's work seemed to be feeder on the approach, but that it is an enormous improvement created by a



**ARMSTRONG-SIDDELEY** P. 182 for fixed-wing aircraft is much up rated (top) and P. 181 for rotary-wing application (bottom). P. 182 delivers 3,075 shp., P. 181 output is 950 shp.



in normal position (left).



**ROLLS-ROYCE** RB 105 was developed for both engine VTOL and STOL aircraft. Five are installed in Short SC 1 VFR, now undergoing infrared testing tests.



## The electronics engineer who had an ear for harmony

Vought fighter development is more than a matter of airtight. Electronics play an increasingly vital role, too. Guy Redmond showed how well the two efforts can harmonize in an engineering classic that encouraged a man to reach beyond his own field.

Guy was named Electronics Project Engineer for the Crusader, and a potentially promising choice he was. An electronics specialist by training and inclination, he held both T.E. and M.E. degrees. He knew the complexities of electro-mechanics from work on earlier projects. And his constant provings and related areas had marked him especially for the job. Guy's wide knowledge bridged the gap between electronics and aerodynamics.

To assay two-headed problem involving electronics and airtight, Guy sought the answer that would best serve both interests. Through Crusader development took most of his attention, his memory was encyclopedic.

Electronics specialists confronted with propulsion men, for example, in coding the Communications-Navigation-Identification package. Together, they found a neat answer in the Crusader's air conditioning system. Aerodynamics, engine and electronics engineers reached an ingenious compromise on the location of vital accelerometers.

Everywhere in the Crusader, electronics masked with airtight requirements. Stabilization equipment, sensors and other systems developed in Vought's own labs were tailored to fit from the start. Purchased items got the same treatment, often requiring major improvements in the process.

Standards were high...higher in resistance to environmental in some cases than had ever been asked before. But the Crusader project was not held up by an electronic snarl.

In fact, the harmony that Guy Redmond symbolized had a distinctly opposite effect on Crusader development. The fighter raced from proposal to Fleet service faster than any comparable aircraft ever had.

Expansion of electronic development capability at Vought is creating a unique role for the electronics engineer. He is not only an electronic specialist, but also becomes the most advanced engineer, and often uses crews with complete missiles and fighters.

For details on select openings, write to:  
C. A. Reiss, Supervisor,  
Engineering Personnel, Dept. A-18



### A Vought Vignette no. 1 in a series



TURBOPROP combustion chamber used in Royal Aircraft Establishment's rocket development program.

function of the turbine below which normally feeds most of the compressor heat.

Once the engine is shut off or an observer notices that the nose drops as suddenly as if the engine had been cut.

#### Helicopter Turbine

Napier's first turbine, Gasifice, got its name from the Worthington Wheel and is designed to be installed in the first prototype of the Bristol 172 helicopter. An assessment of a contract between Napier and a source whose fate needs a concern is expected to be made shortly. Meanwhile, Napier has signed a contract with Rrol, the Italian company for conversion of three of its Corvairs, with a power of 17, more if the first three work out as expected.

One installation's advantage of the

Gasifice is its adaptability to angulars because it can be placed in any position from horizontal to vertical. The Worthington installation reduces the engine 35 degrees from a horizontal reference. Rrol will place one Gasifice at 7 degrees and the other at 17 degrees from the vertical in the Type 172.

Napier's shop also showed a model of the Bristol 172's Gasifice conversion, converted to use some of the company's Elend turbogenerator powerplants. An assessment of a contract between Napier and a source whose fate needs a concern is expected to be made shortly. Meanwhile, Napier has signed a contract with Rrol, the Italian company for conversion of three of its Corvairs, with a power of 17, more if the first three work out as expected.

Rrol proposes a complete installation



### Hispano Suiza Aircraft Guns

Hispano Suiza Type 521 30 mm aircraft gun (middle) has muzzle velocity of 1,310 ft./sec., weighs 240 lb., including feed mechanism. Type 518, a 20 mm gun, has muzzle velocity of 1,495 ft./sec. and weighs 145 lb. Boring size of both is 1,000 ft./sec.

HERE THAT IN THIS HARMONIC IS 100% RATIO AS SIMPLY ONE WAY AND IT IS ABSURD RECALL THE MUSICAL PRACTICE TO REHEAR



\* So basic are Eekel contributions to the field of small solenoid start-off valves that it is impossible to match Eekel performance without using Eekel features.

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bring the empty weight of the missile to a minimum.

The propellants of the Hawk are distinct in that it contains two separate solid fuel charges in a single chamber. The first is the booster which burns rapidly to accelerate the missile to flight velocity quickly. The second is the motor which maintains flight speed. This construction makes the Hawk even easier to handle than other solid fuel missiles because it eliminates the external booster and

The Hawk, which is a high performance missile, is the result of a joint development of Thiokol Chemical Corp., Berthoud Manufacturing Co. and Northrop Aircraft, Inc.

### Stretchouts Leave F4H, F-101A, C, Unaffected

St. Louis, Mo.—Some changes for low defense contracts affect McDonnell Aircraft Corp. work given as a contract to capture by President J. F. McDonnell and his associates. McDonnell will subcontract the F-101C and F-101D, a modified version of the Voodoo for fighter-bomber missions.

Neither the F-4 or RF-4C nor the PHM for the Navy has been stretched out or terminated, McDonnell said. The F-4D and F-4B programs have been stretched.

Five orders McDonnell delivered reduced from 12 to 10 per month through February, 1958, and to 17 per month beginning in March, 1958, in meeting delivery of the last 100 aircraft on the F-4C contract to March, 1959.

USAF ordered delivery of the F-101A and F-101B reduced from 16 to 20 a month, extending last delivery date of F-101As on order from March to August, 1959. McDonnell said he expected additional F-101s and F-101Bs to be ordered from Fiscal 1959 approximation, extending delivery through 1959.

USAF said the F-101C modifications consist of strengthening wings, fuselage, etc. to prepare for the relatively more rugged nature of fighter-bomber. Strategic Air Command reportedly delayed acceptance of the Voodoo, which is the F-101C. Voodoo will be modified, with result that most will be modified to C configuration.

### Conical Camber

English-Cossor radio leading edges have been added to both the Avon Vixen B Mk.1 and the English Electric F.1A for flight evaluation of the NACA development. English Electric reports some improvement of performance in high altitude cruise conditions but believes other performance improvements could mitigate against its use on the production series.

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AMPHENOL product development



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Development of this protective coating—which resembles insect shell effective after molybdenum alloy sheets or shapes are formed into parts of complex shapes—is part of the advanced metals research programs at Westinghouse. The Aviation Gas Turbine Division is helping to keep America strong by applying this coating and other new research developments to create better and better jet engines for the defense of America.

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Hawker Siddeley Victor bomber despite its cluttered nose has exceeded Mach 2. Victor is in production and first operation is expected to be finished late this year.



## British Bombers, Fighters Exhibit Design Revisions

Avro Vulcan B.2 has revised bomb-timing position with masked over wings below cockpit. Crew entrance door also is out for downward ejection seat. Vulcan is now in operational service in one group of Bomber Command.



Hawker Hunter (left) shows tipped tailplane being tested as a possible configuration change on the aircraft. Wingtip of Fairey Firefly fighter-bomber (right) carries four wide-angle cameras to record data and area ahead of test aircraft.



Gloster Javelin with Fairey firefly (right) fitted on tailfin, lengthened tail pipes. Flame is being used in development work.



Drag chute and brakes open, Firefly landing development at Farnborough (above). Vulcan landing down (below) shows wing wake generation, flame in brakes and aero deflection. Critical leading edge is discernible about midway out on the wing.



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## Ground Test Load Cycles Called Invalid as Fatigue Life Measure

By Russell Hawks

Los Angeles—Predictions of the fatigue life of an airplane in terms of hours or load cycles or the like of ground tests were termed invalid by Ericson H. Lufstrand, Douglas Aircraft structures engineer in a discussion here before the Institute of the Aerospace Sciences of the DC-8 fatigue resistance program. The jet transport a designer doesn't worry by fatigue criteria and even prior to flight in a precisely tested and even designed relative to the static load levels.

Lufstrand said Douglas has used a "qualification" testing program to learn whether a component and component will be satisfactory relative to some equivalent structure known to be serviceable. This is a traditional laboratory method of checking a test

specimen against a control specimen of known characteristics.

### Fatigue Effect

Douglas abandoned as fruitless the effort to set up recommendations of the number of cycles or the amount of load required to render a component fatigued to fatigue. Lufstrand said that arterial softening of test results was never such a basic fault that numerical approximations have little value. The one quantitative application of test results should at least avoid the growth of much more expensive in the field and.

Other objections to making quantitative predictions of test data are the difficulty of defining a complex stress waveform, the need for small load and life deflections, and the difficulty of duplicating actual flight



Gen. Power Flight-tests B-58

Gen. Thomas S. Power, commander in chief of SAC, emerges from B-58 following test flight. Note use of disposable hook and strong bungee cordage.

loads. The only economic way to get the equivalent of 10 years of flight loads would be to run 10 years of lab fatigue tests and it would call for extremely sophisticated equipment. Accelerated forming cells for a certain amount of shaking or load and other conditions which may have unpredictable effects on results, Lufstrand said, and in the acoustic frequency range it is nearly impossible to accelerate test

### Critical Structure

Critical structure has the finger standard usually includes a part of some kind. One form of the Douglas comparative testing used is to check such a structure against a similar standard structure. If it can withstand the same test for an appropriate equal number of cycles, it can be considered serviceable. If fatigue cracks appear uniformly before they do in the standard specimen, the part must be redesigned.

Another form of comparative testing used is to check a specimen against the equivalent test at a proven airplane such as the DC-8. If each unit is tested at an appropriate normal stress level, Lufstrand feels it is reasonable to assume that a DC-8 specimen which matches the fatigue resistance of the DC-8 part will prove not unsatisfactory well in service.

This approach has known weaknesses, however. If a part has given trouble in the proven airplane and the equivalent part in the new airplane tests out better, it still is impossible to say the new part will not give trouble in service.

In such an ambiguous situation, some other approach must be used.

### Statistical Validity

An test, of course, must be repeated often enough to give some idea of its statistical value and validity. On the DC-8, the maximum number of flights on some fatigue specimens has been four and rarely as much as higher. The proportion of the whole airplane to be used as a test specimen is a compromise. The advantages of the small specimen in ease of experimental control and low cost-time requirements for repetitions must be balanced against the advantage of getting a complete evaluation of parts in a large specimen.

Douglas has used a certain progression from one size of specimen to the next way long ago. The tested part of a recommended cabin structure testing on the DC-8 was done on 6 ft. x 10 ft. "strip panels". A specimen of this size is large enough to include several segments of the "strip panels" fuselage design.

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## AVIONICS



NEW FUEL CELL, which directly converts hydrogen and oxygen into electricity without combustion or moving parts, operates at moderately low temperatures and at atmospheric pressure, unlike previous fuel cells. It was developed by National Carbon Co.

## Gases Provide Silent Power Source

By Philip J. Klass

Fuel cell which directly converts hydrogen and oxygen into electricity by an oxidation at moving parts, and operates at moderately low temperatures and at atmospheric pressure, unlike previous fuel cells, has been developed by National Carbon Co., division of Union Carbide Corp.

Hydrogen-oxygen fuel cell offers attractive advantages over engine-driven generators or storage batteries for remote mobile applications in or near combat areas.

### Neutrino Unit

Unlike engine-driven generator, new fuel cell does not produce heat, noise and vibration, and is not subject to fire and explosion hazards.

For moderately high powers of long duration, fuel cell and an hydrogen-oxygen supply may prove smaller, lighter than equivalent storage batteries. Furthermore, fuel cell can be recharged by replacing empty supply cylinders.

National demonstrated its new fuel cell last week at Army's Electronic Proving Ground, Ft. Monmouth, N.J., using it to power Army's new portable radio

used in infantry to detect infiltration of front lines.

Concept of the hydrogen-oxygen fuel cell dates back at least 120 years, and successful fuel cell was produced some 70 years ago. Interest has shifted to steam-hydrogen-oxygen generator for generating electricity, and only recently been returned to the fuel cell.

British investigation of hydrogen-oxygen fuel cell began around 1931, but interrupted by the war, were resumed at University of Cambridge in 1946. P. T. Brown, Russian scientist, indicated by papers published in 1947.

In this country, Patterson-McCormick of Universal Winding Co., Binghamton, N. Y., is developing fuel cells, using Brown's principles, for underground government agencies.

### Several Advantages

Compared to previous hydrogen-oxygen fuel cells, National Carbon claims some advantages for its design, admits at least one disadvantage which may or may not be overcome.

National demonstrated its new fuel cell last week at Army's Electronic Proving Ground, Ft. Monmouth, N.J., using it to power Army's new portable radio

powered drivers. Furthermore, it can operate at atmospheric pressure whereas former fuel cells operated at pressures in range of 600-800 psi (460).

Company's Dr. George E. Evans, assistant director of research, says fuel cell can be operated with ordinary air and decomposes only hydrogen, emitting only water vapor, so it can produce no output. Operation with air does not contaminate National's cell, Evans says, contamination reportedly rises a problem with previous hydrogen-oxygen fuel cells.

### Efficiency Evaluation

Volumetric efficiency (input power per unit of cell volume) in National's cell is only about 10% of that of the British and Patterson-McCormick fuel cells, but is publicly the best and figures quoted by company spokesman illustrate volumetric efficiency increases that National may be able to match the performance of other cells by spending at higher pressures.

Hydrogen-oxygen fuel cell is one of several types under investigation for direct conversion of chemical energy to electricity without involving others.

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### CONTINENTAL AIR LINES-JET ENGINES TO PAC

Continental Air Lines, Inc., equipped with Pratt & Whitney J-37 jet engines has contracted with PAC for the overhaul and maintenance of its fleet of aircraft. PAC's highly substantiated experience in J-37 service and maintenance was a major factor in Continental's decision to have its jet engines overhauled rather than to set up their own J-37 overhaul shop at their new Los Angeles base. This is one of many instances that would have been required to train personnel, plus the capital needed for special J-37 maintenance and repair equipment, are thus saved by contract.

### JET ENGINE SHOP FACILITIES

and a special engine run-and-test cell will be constructed by PAC to handle the enlarged J-37 overhaul program.



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use different materials. The hydrogen-oxygen cell basically is a reversal of the familiar process of electrolysis in which electric current (loss of chemical energy) passes between two electrodes immersed in water. Electricity decomposes water, causing hydrogen to be released at one electrode, oxygen at the other.

In one configuration, hydrogen-oxygen fuel cell converts the heat released during the cell's operation with an electrolyte, usually potassium hydroxide dissolved in water. Natural gas carbon electrodes treated with nickel catalyst. Parsons-Monza and others reportedly are testing similar electrodes.

Hydrogen is piped into hollow center of one electrode, oxygen into after. Both gases diffuse through porous electrodes, meet with the electrolyte to generate electrons (direct current) potential across the two electrodes and produce water (H<sub>2</sub>O).

### Decomposition Law

Unlike conventional batteries, whose electrolytes and/or electrolyte are slowly consumed or changed in the process of generating electricity, National says its fuel cells have operated for a year "with no signs of deterioration." Cells were operated on an eight-hour per day, five-day-per-week duty cycle.

Voltage generated across electrodes of a single fuel cell is about one volt, depending upon the cell efficiency and current being drawn. Voltage drops with increasing current (load). Although a number of fuel cells can be connected in a serial series-parallel arrangement to produce wide range of voltage-current ratings, National says its device is



modification of Lockheed service at an Air Force base. The aircraft and ground support equipment are used a few of the activities carried on at Pacific Airmotive Corp. PAC maintains a technical service center at Santa Monica, California airports.

**PRODUCTION OF LEARNERS** — considerably the first, most sophisticated avionics equipment on the air force's flight line is a Learjet, shown here at PAC's Pacific Airmotive facility in Santa Monica. In addition, Pacific Airmotive provides aircraft repair and maintenance services for Lockheed and Learjet aircraft owners.

Central power natural PAC facility for complete information on parts, accessories, engine, aircraft and aircraft maintenance and modification. Address: Pacific Airmotive Service for method of parts and accessory purchases.



### Airborne Chisel

Macaroni version of Chemtrons' methacrylate tube, outside for displaying color targets and data link information in the form of letters, numbers or symbols, has been developed by Boeing-Cobalt. New Chemtron has five-inch face, measures only 174 in. long, compared to 404 in. length of previously available 7-in. face tubes. Feeding is accomplished by means of a special target chisel, consisting of a curved face and conical tip rods. External deflection tube is required to position chisel on target face. Chisel tips are approximately 8 in. high.



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## MINIATURIZED CAPACITORS

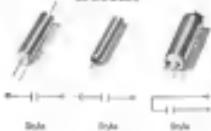
Utilizing Mylar dielectric and a special conductor, Airborne miniaturized capacitors offer standard dimensions up to 12 times lighter than those of ordinary capacitors of comparable size and weight. Vacuum impregnated and hermetically sealed in drawn steel cans or epoxy

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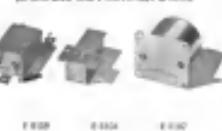
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## TYPICAL SPECIAL CAPACITORS (By JAN C-25 MIL-T-4161B, MIL-M-3450)



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Accuracy check-out of AGC-10 gunight (long-range) radio on Republic F-84F is performed by matching horn which directly couples aged insulation from antenna mounted in air miles. Model F-50 horn, developed by The Northrop Corp., Moses Lake, Wash., replaces previous technique which extracted sample power from wiregauge, did not give complete check on insulation low and excess performance.

possible to those reported by British and Italian researchers.

Once a cell has been brought up to operating temperature by external source, heat generated by energy dissipated within the cell itself is sufficient to maintain that temperature. Naturally, the cell will be used to bootstrap itself up to initial operating temperature by short-circuiting the cell, but this may involve an initial warm-up time of several hours. Dr. Evans says:

"Cell is not damaged permanently by accidental short circuits, according to

Dr. Evans. If short circuit occurs for extended period, it may produce some carbon on the electrodes which can be cleaned off by strong electrolyte solution. This can be tested easily by strong electrolyte.

At present the hydrogen-oxygen fuel cell does not appear to be a serious threat to hydrogenation in engine-driven generators for large scale power stations because of present cost of producing hydrogen and oxygen. However, National researches speculate that solar or nuclear energy may provide an economic means for developing water into hydrogen and oxygen which would then make the fuel cell a serious threat to power stations for many applications.

## Expansions, Changes In Avionics Industry

Northrop Aircraft has set up a new avionics division which will be responsible for the company's expanding avionics development, manufacturing and marketing activities. Dr. William F. Bellows, vice president, has been named general manager of new division.

Other recently announced changes and expansions in the avionics industry include:

- Kristen Company's Western division has opened a new branch office in San Francisco, and G. C. Bellows is general manager.
- Defense Systems division of Dynacor, Inc. will build 30,000 sq. ft. laboratory in La Jolla, Calif. (near

AIRAVION WEEK, September 25, 1957

## WRITE TODAY:

For complete info and general engineering assistance. Our representatives are at your service.

Write to Dept. 22





New **Passive Refrigeration** works at Honeywell's temperatures such as the subcooled sub-saturns shown. This new system has no electricity. At any such low temperature, Honeywell can put a jacket of special material which is solid at normal temperatures, right into a liquid nitrogen bath and soak up the heat without changing temperature (heat of fusion). This keeps the insulation at a safe plateau in spite of intense super temperatures encountered in missile speeds.

## PASSIVE REFRIGERATION—

### *new shield against super heat*

Steady, lightweight, non-refrigerated—it keeps precision controls at peak performance for up to 30 minutes at ambient temperatures of 500 degrees.

It's hard to imagine a more powerful weapon in man's war on heat than a substance that cools with the simplicity of a cake of ice... self-contained, no moving parts, no auxiliary equipment to add weight to missile and aircraft.

It is this principle of **Passive Refrigeration** (cooling without external power source) that Honeywell Aero engineers have put to work protecting components used in their advanced guidance systems.

With **Passive Refrigeration** these components are able to withstand temperature plateaus as high as 500° F. And in the near future you may find **Passive Refrigeration** cooling components in advanced interceptor aircraft and anti-missile missiles.

**Passive Refrigeration** is another example of Honeywell Aero's continuing contributions to the research, development and production of aerospace systems ranging from guidance to fuel management, from engine control to flight stabilization.

If you are working on projects where super heats will be encountered, perhaps Honeywell Aero has the answer to your problem. Honeywell's Aero engineering group is prepared to develop components or systems utilizing **Passive Refrigeration** for any type of missile, rocket or aircraft. Contact Minneapolis-Honeywell, Aeronautical Division, 2600 Ridgway Road, Minneapolis 13, Minnesota.

**Honeywell**

 *Aerospace Division*

# American Girl Breaks Russian Record In The Aero Commander 560-E



**THE PILOT:** 26-year-old Miss Jeanne Cobb of Ponca City, Oklahoma, a slender, attractive blonde who has been a licensed pilot since her 16th birthday



**THE PLANE:** A standard production model of the new Aero Commander 560-E, a 7-passenger executive transport with a 1,035-mile range, plus safety fuel reserve



**THE ROUTE:** From Guatemala City to Oklahoma City, a 1,522-mile non-stop solo flight to beat the Russian record of 1,235 miles for planes in the 3,658-pound to 6,613-pound class



**THE NEW RECORD:** A 1,522-mile non-stop solo flight in eight hours and five minutes. Average speed was 190 mph. Remaining fuel, 39 gallons.

This story of superior range, flying comfort, high speed and ease of handling only begins to illustrate the reasons for Aero Commander's enthusiastic acceptance by pilots and executives the world over. Send for free brochure.

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560-E - 560-E

AERO DESIGN & ENGINEERING CO. • TULAKES AIRPORT • P. O. BOX 118 • BETHANY, OKLAHOMA

San Diego. Occupancy is expected by early 1958.

\* **Aerotech Electronics Corp.**, Natick, Mass., is name of new firm which will specialize in avionics and datacom systems. Company is headed by Isaac L. Aerotech, former director of general products division of Bausch-Camp.

\* **Chicago Aerial Industries, Inc.**, has formed a Components division to manufacture and market precision electronic components. New division, headed by Gordon B. Baumgarder, will be located at 10125 Franklin Ave., Franklin Park, Ill., when new facility there is completed. Initial product will be a line of precision potentiometer assemblies.

\* **Potter Instrument Co.**, has opened new 30,000 sq. ft. factory and office building in Pleasant, L. I., N. Y. on Sunnyside Blvd.

\* **Syntron Corp.**, maker of seismic instruments and automotive control systems, will build 15,000 sq. ft. plant in Concord, Calif.

\* **Citrus Electric Co.**, has moved manufacturing operations and offices from Pittsburgh to new 25,000 sq. ft. plant in Delmont, Pa., located on Old Wilkins Penn Highway.

\* **Applied Science Corporation of Princeton (ASCOPI)** has opened south western sales and service center in Dallas at 4914 Greenville Ave.

\* **Leedy Manufacturing Corp.**, Glen Head, N. Y., has purchased Rous Laboratories division of Detroit Bolt Testco, Inc. New acquisition, which will operate as a Leedy division, manufactures continuous measurement equipment.



\* **R.W. Davis Offer Hot-Harvest-Wind design Corp.**, widely known for its role as technical director of Air Force ballistic missile program, is seeking to counter possible industry opinion that it intends to compete with aircraft manufacturers for missile prime contract. R.W. officials are visiting major aircraft companies to explain that company wants to work as a major source subsystem contractor to McDonnell Aircraft Co. on Quark, new countermeasures missile.

\* **Prudential New England Telephone**, new telephone lake which reportedly is five miles more efficient than existing backward-wave oscillators,

## EMERGENCE...



## FROM EMERGENCY

When emergency electrical power is available, the fears of flood or other natural disasters are quickly minimized. **CONSOLIDATED** designs and manufactures generator sets to provide stand-by power in the event of failure of normal power in hospitals, schools, police and fire stations, and other areas of need. ►►► Other generator sets of our design are available to supply continuous power where commercial power is unreliable. For the military, for instance, our sets furnish electrical power for perimeter, radar defense, warning lines and communications.

►►► Pictured above is a typical **CONSOLIDATED** diesel generator unit, 4-wheel trailer mounted, fully housed. If you have any additional power requirements, our engineers are anxious to discuss your needs.

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unceasing ultimate insulation for Hughes Aircraft Co. on a \$1.9 million contract.

• Minneapolis-Honeywell has secured under for mass-produced fuel-injection equipment from The Martin Co. for use on its F7M-2 jet patrol bomber. • Collins Radio Co., Cedar Rapids, Iowa, has been awarded an \$8.5 million contract by Canadian Department of Defense for production of AN/ARG-51 UHF airborne transceivers. Canadian version, to be called the ARS-552, will be produced in Collins' Terre Haute plant.

• Illinois Electronics Co. has received a \$100,000 contract for development of television monitoring equipment to be used in launching, recovery, and recovery of Martin's T-2000 missile plane at Denver and the Aerospace center in Edwards, Colo. The contract provides for 24 options at \$10,000, \$2 at Edwards, with contract capable of withstanding rocket engine exhaust blast.

## NEW AVIONIC PRODUCTS

### Components & Devices

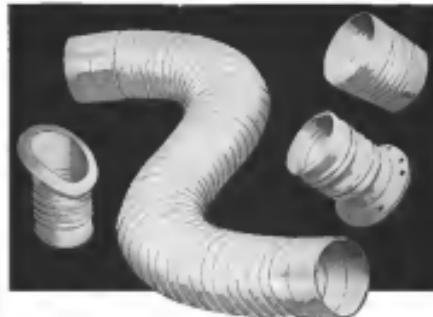
• Bidirectional spring mechanism for use with mechanical and electro-mechanical reading computers weighs 10 oz. and is 1.5 in. long, 1.25 in. wide, 1.25 in. high. Two sets of washers with differential, can be supplied in metric, using Great Line of Quarter Square Square measures. Hedrick and Walker 3 by 5 by 1 in. Minature metal flexible transmitter Corp., 111-03 14th Ave., College Point, New York.

• Strainmeter motor, type 8125 B1, is single phase five capacitor type operating on 400 cycles. Sine 15 amperes at 12,000 rpm and has 0.85 in. of pull-out torque with 20 watt

• Strainmeter motor, type 8125 B1, is single phase five capacitor type operating on 400 cycles. Sine 15 amperes at 12,000 rpm and has 0.85 in. of pull-out torque with 20 watt

power consumption. Unit can be controlled in a two phase circuit, as in single capacitor type, or in a complete current loop. Weight 1.9 lb. and is about MLE 6273. H weight 1.9 lb. and is furnished with plain type shaft. Marathon Corp., 1000 10th St., Beloit, Wisconsin.

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that will help you solve  
your aircraft ducting problems

### What is Flexflyte?

A lightweight, reinforced ducting made of a spring steel wire braid covered with coated fiber glass or a cotton fabric and bound with a fiber glass cord.

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Flexflyte is designed for use with ventilation, de-icing, de-icing and hydraulic systems.

### How flexible is Flexflyte?

It will take tight turns at any angle up to 180° without kinking. No elbows or fittings are required.

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### Is it flame resistant?

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### Published exclusively by Aero Enterprises Co. and Aeroplane

Co., and by Associated Industries in Seattle, Washington.

## Flexible Tubing

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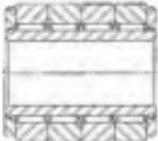


## Special Torrington Bearing smooths feathering of Hamilton Standard Reversible Propellers

Hamilton Standard's Reversible Hydrodynamic Propeller, standard equipment on a majority of transport aircraft, provides feathering of blade shear for shorter, safer landings. It also enables the pilot to feather the propeller to stop or prevent nosediving on a malfunctioning engine.

Four special Torrington Can Roller Needle Bearings hold gear segments of the propeller's reversible mechanism. The unique full complement of needle rollers provides the highest possible radial load capacity with low horsepower torque, permitting rapid or quick changes.

These special bearings are an adaptation of a standard can roller aircraft type. Needle Bearing, developed with the help of Torrington's extensive experience in design and application of Needle Bearings for aircraft. Take advantage of this engineering experience through your Torrington representative or write: The Torrington Company, Torrington, Conn., 06790, and South Bond 21, In.



Special Can Roller Needle Bearings designed for Hamilton Standard propellers of transport aircraft, provide feathering of blade shear for shorter, safer landings. It also enables the pilot to feather the propeller to stop or prevent nosediving on a malfunctioning engine.

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## WHAT'S NEW

### Publications Received:

Aircraft Mechanic's Pocket Manual—by Joseph A. Addante—Pub. by Pitman Publishing Company, 2 West 45th Street, New York 10, N. Y. \$1.75, 127 pp.

This available data has been prepared to explain why the various methods, processes and finishes are used in aircraft construction.

The Physical and Thermodynamic Properties of Fluids—by J. S. Rowlinson and P. J. Tink—Pub. by Pergamon Press Ltd., 915 No. Caxton Avenue, Los Angeles 33, Calif. \$10.00, 84 pp.

This report briefly summarizes currently available information in both tabular and diagrammatic form on the physical and thermodynamic properties of gaseous substances.

Physical Abilities to Fit the Job—by Bert Haunert—Pub. by Engineering Department, American Metal Industry Association, 1221 Berliner Street, Suite 17, Miami 12, Fla. \$1.50, 141 pp.

Written with complete detail, this book tells how to determine one's own worker's physical abilities, and relates these to job requirements safely and productively.

Testing of Weighting Equipment—by Ralph W. Smith—Pub. by National Bureau of Standards, U. S. Department of Commerce, Washington 25, D. C. \$1.25, 199 pp.

This publication is one of a series of handbooks designed to present in compact form comprehensive information relative to weights and measures inspection.

The Recognition Guide—Pub. Recognition & Transaction Letter, 1020 New York Avenue, N. W., Washington 5, D. C. \$13.00, 202 pp.

This guide series available to defense contractors, all of the important information and guidance, both official and unofficial, that has been produced over the past five years, beginning with the passing of Chapter 10 of the Recognition Act of 1953.

Invention and Invention—by C. D. Fink—Pub. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, New York. \$3.75, 155 pp.

A manual that will encourage any reader's creative thinking, familiarize him with the psychology and methods of invention, and help him protect, register, and market his invention.

Bearing Design—by Dr. Donald F. Wiltcock, and Dr. E. A. Isaac—Pete Mc

Graw-Hill Book Company, Inc., 190 West End Street, New York 10, New York. \$12.50, 470 pp.

The book considers bearing designs and applications from three aspects: the design of the bearing, the materials from which the bearing parts of the bearing are made, and the lubricant used.

Basic Mathematics For Radio And Electronics—by M. Coflebeck and J. W. Head—Pub. Philosophical Library Inc., 17 East 45th Street, New York 10, New York. \$6.95, 339 pp.

The book deals with the basic prin

ciples of three branches of mathematics which many years of practical experience in radio and electronics have shown to be definitely necessary.

ASTM Standards on Petroleum Products and Lubricants—by ASTM Committee D-2—Pub. by American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. \$7.50, 1058 pp.

This publication includesitative and standard methods of test, specific definitions of terms and classification of petroleum products with related information, and proposed methods of test.

*on the shelf*

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# EQUIPMENT



ARTIST'S CONCEPT of a jet airplane being stopped by an All American Model 55 system barrier and water sprayer.

## New Runway Barrier Design Details

By George L. Christian

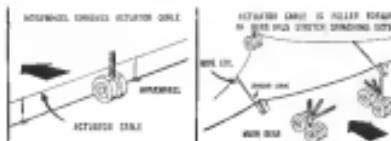
Woodburn, N. J.—Gaining emphasis in runway overrun barriers for military—and possibly commercial—airfields is underlined by three recent barrier de velopments: awards for safety by application; the creation of entirely different types; and the production of a new barrier.

• E. W. Blaw Co. has developed an overrun barrier for installations at Vandenberg, Calif., Air National Guard field, Eggersport, undergoing final tests prior to delivery, scheduled for Oct. 1. Arresting capsules are infinitely recyclable, measuring 5 x 6 x 2 ft. They use a gas of B52 lighter in energy than air. Two engines, each with a 20-million ft/lb capacity, have been built for installation at opposite ends of the runway.

Blaw has also developed, under the



AAFS Model 540 water sprayer arrester. Inset (top) shows parts in liquid-filled tube.



AAFS MODEL 540

trademark of Catapult, a fully integrated concept for breaking planes with the air, anchoring them at land and trapping them to use them without a runway.

The system is used at commercial and military airfields. German forces have and a land-based, stress-powered catapult were recently demonstrated at Blaw testing facilities here at Woodburn Airport.

• All American Engineering Co. has installed one of its Model 540 arresting capsules with an MA-1A barrier at a undisclosed airfield where it has been fully operational for over two months. Device uses a water sprayer\* in a cyclic spraying, a liquid filling passes through liquid-filled tube to spray on target.

AAE has Model 540 arresting capsules in full production. Company also has a contract to install a continuous line arresting gear and overrun barrier using a water sprayer spraying engine, at Norfolk Naval Air Station.

All American recently held a sensible discussion with representatives of Civil Aeronautics Administration, Air Line Pilots Association and the Port of New York Authority concerning the application of overrun barriers to commercial airports to determine how the several problems should be attacked.

• Van Zelst Associates, Inc., under a contract with USAF's Air Research and Development Command, has developed a liquid-filled tube overrun barrier installation at Edwards Air Force Base at Edwards AFB, Calif., and first tests are expected to begin by Nov. 1. Arresting engine drops it need on the barrier bank profile.

W. D. Van Zelst, who leads the firm, told AVIATION WEEK that the air spraying engine, with an engine thrusting capacity of 100 million lb, will be the largest ever built in this country.

Barrier was designed to stop B-75s at a landing weight of 200,000 lb at an impact speed of 110 ft with a 1,000 ft run.

Van Zelst said the barrier's arresting capacity was ideally suited for use with the DC-8 type unpowered jet transport part.

He has sub-contracted design and manufacture of a tail hook assembly to be attached to the bank part of



RAFSS (Rear Arresting Gear Spraying System) shown deployed on a runway (right). Cable shown at the longpost.



CATAPULT launches a 20,000-lb deadload aircraft. Arresting cable is in foreground.



ARTIST'S drawing shows deadload aircraft being launched by catapult at over 100 ft, being stopped by Blaw-developed overrun barrier. Arrows point to underground arresting engine.

# FACTS

about  
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NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

the six main wheel assembly of a B-47's landing gear. First lot will soon be delivered to the Air Force for evaluation on a B-57.

### STOL vs. Catapult

An AVIATOR Was sampling of transcontinental airline's cockpit to observe barriers brought this question: • **Airlines** Airlines—A highly-placed company official and the airline is interested in certain barriers, but under two conditions. One, they must be simple and relatively effective devices two, they should be installed only on aircraft where to crash would be catastrophic to the aircraft and its passengers. He did not feel that barriers were justified only when fitted with adequate and safe aircraft seats.

As to the eventual use of catapults and arresting gear to flew large aircraft to operate from short runways, he was not convinced. He felt that more feasible was of attacking the problem, ones that would be more appealing to passengers would be the development of STOL (short takeoff and landing) principles and protection of boundary layer control to give large aircraft safe short-field performance.

His lack of enthusiasm for catapulting and aircraft transports was based on a feeling that the public would come to fear and shun aircraft that had to be catapulted and landed. • **Trans World Airlines** The engineering department spokesman said that TWA "would like to see the development of an overrun barrier capable of stopping commercial transports...such a device could possibly save some aircraft." He added, however, that barrier would be considered only for runways which had inadequate overrun areas or for short, cross-wind runways whose length might be critical for optimum barrier impact points.

He emphasized that the problem was one which no single airline could tackle independently. It is a problem which will require the industry to agree on such criteria as which aircraft and which runway will need barriers; what type of barrier gear and arresting engines are the most effective and how in the equipment, if provided, going to be paid for. He concluded by saying that "the entire question of overrun barriers for commercial use still needs a lot of development on an industry basis."

• **United Air Lines** Carl Christensen, UAL's Director of Flight Safety, told *Aviation Week* that "our proposal has been made to the airlines concerning overrun barriers, but the subject is still under study and complete and precise cannot be within the jurisdiction of the CAA."

"No formal policy has yet been formed up on that, but before it can be, the following has to be determined:



**BL12** standing engine weight 3,000 lb., is 8 ft. high and has 20-inches (10.75 in. dia.) diameter propeller. Canted nacelle at top has hydraulic control device to facilitate changing from each side of the aircraft) through pitot tube. Motors apply pressure to BL12 blades which stop plane. Motors at bottom rotate nacelle.

the best configuration for the engaging position at the early instant of landing to be arrested whenever an emergency occurs.

### Type of overrun barrier installation

• **How will it be controlled—by the pilot or the control tower?**

• **Who will have installed control?**

### Noise Reduction

One interesting remark made by an airline about catapults was that the device of getting planes into the air quickly could help measurable in alleviating the noise problem around airports.

The CAA official said his agency did not yet have any opinions concerning overrun barrier requirements for commercial aircraft.

Some conclusions reached at the recent All American Engineering sponsored meeting, held at the company's test base at Slauson County Airport, Georgetown, Del., were:

• Neither airline management nor airlines will allow hardware to be hung on commercial aircraft for the specific purpose of engaging as overrun barrier. A component must be incorporated with aircraft structure in the "as is" configuration.

• Overrun barriers should be simple, foolproof, highly reliable, easy to install and withstands weather conditions such as dust, snow or sleet. Preferably, it should be so placed as a run way that it would be lateral the normal operating area. This would allow it to

be kept constantly at the engaging position at the early instant of landing to be arrested whenever an emergency occurs.

The various agencies represented at the meeting—CAA, PNTA and ALPA—agreed that, from an overall point of view, overrun barriers appeared to be useful devices to protect planes from damage in case of an aborted takeoff or an overheat landing.

This suggested that All American officials submit to them for a study a proposal having the latest suggested figures and tables and landing weights of the highest commercial jets now being built.

### Catapult Components

Three general components (and stages) of that proposed Catapult are:

- **Overrun barrier**—already developed for the military, this technique has will be the first of *Catapult's* three components to be used in civilian service. They are that such devices as United, TWA and American have experienced in aircraft in overrun barriers.

- **Arresting gear**—Next step will be to develop a system which will bring planes to a soft, non-stop stop in a fraction of the distance required with conventional landing methods. With catapult-mounted blisks, arresting gear will permit even large, heavy planes to

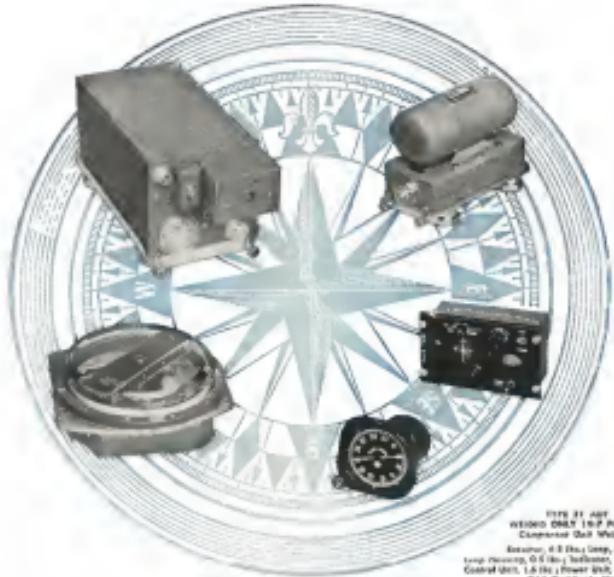


FIGURE 21. ARC Type 21 ADF  
Weight: 1.5 lb. (radio), 2.5 lb.  
Compass: 0.5 lb.  
Antennas: 4.2 lbs.  
Total: 8.5 lbs.  
Power: 0.5 lbs.  
Control Unit: 1.6 lbs.  
Power Unit: 5.5 lbs.  
CAA Certificate No. 18-49  
MIL. — ARI/AFM 85

## NEW LOOK in navigation aids

**The Time Tested ADF Now In Less Weight, Less Space**

The ADF is a basic air navigation instrument, used in all parts of the world, tunable to some 60 transmitters. But the important thing now about the ADF is that ARC has engineered an ADF system down to less than 20 pounds in weight, with a considerable saving in space.

Now pilots enjoy the advantages of dual installations of this compact miniaturized equipment in tolerable weight and space requirements.

The ARC Type 21 ADF is built to today's more stringent speed and environmental demands. It has hermetic sealing of vital components, such as the antenna loop assembly. It covers all frequencies from 190 to 1750 kc... operates on only 2.5 watts at 27.5 watts dc input. A significant feature is the extremely low loop drag — only two inches below the circuit skin.

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fit from one pocket size unit.

+ **Catapult**—300,000 lb. plane boosted by a catapult to 60-70 ft. over a distance of about 300 ft. would use half the runway as the current plane of comparable weight would require, according to Bissel engineers. catapult's acceleration would inquire 3-4 G's on plane's passengers which would be hardly perceptible and unlikely to provoke adverse reaction. Mathis still would be straightforward and simple, since it would need to generate a lifting load of only 100,000 lb. Cost would be approximately \$300,000.

This spokesman's version's new concept is compared to 16 current catapults, for catapulting conventional aircraft. Catapults would be a continuation type.

Mathis would be coupled to it automatically in either sequence mentioned. A catapult would be tied to the catapult, be coupled and launched without the passengers' knowledge knowing what was happening. As soon as one plane was clear of the catapult, the next plane would take its place and be launched without waiting for the catapult to be repositioned.

### Simple Catapult

Mathis engineers demonstrated a steam catapult here recently—one they claim is the first to be developed in this country specifically for load research as external carrier using a Blodgett-developed steam-shunting engine, he adds.

Both devices are recommended with a 10,000 lb. test vehicle which was launched twice in the catapult with the banner at speeds of 98 and 110 mph, respectively.

Domestic design philosophy of cable pull and brake like was to keep it simple. Catapult is a single-link device made out of commercially available parts and operated by 2,000 psi steam pressure.

Steam is provided by a standard, oil-fired steam generator manufactured by the Bisco Boiler Corporation. Maintenance which takes about one-half hour of space, is the present enough time to complete this procedure. The pull should take over 35 minutes for the continuous type of operation as claimed by full-scale commercial use. A bank of these steam generators would provide the greatly increased power demand.

Steam is piped into one large air controller where it is stored under pressure up to 2,000 psi. When catapult is fired, pressure is released into a 5 ft. length of commercial, cold-drawn stainless steel tubing 7/8 in. in diameter. Steam pushes a steel piston, equipped with clevis plates, along inside the cylinder to produce 100-ft. 1/2 in. of kinetic energy.

Carbonized steel cable is attached to the piston and runs over a pair of sheaves at the head of the catapult. From one of these sheaves the cable runs back to the test vehicle (the plane) several hundred feet down the test track. The cable is attached to another sheave which is located at the head of the catapult. The cable is then stretched in a U-shape with the apex at the test vehicle. From the free sheave cable runs under the banner to the piston. When the catapult is fired, the piston pulls the two ends of the cable down the track after it

### Smooth Acceleration

Steam is generated from escaping from the nozzle of the catapult in a low-velocity jet. As the piston travels down the tube, the cable would accelerate the test vehicle to the desired speed. No brake is required because the steam jet generates the force of the catapult and the own weight of the test flying aircraft to generate its own braking forces. When test vehicle is launched from the catapult table it stretches fast because the two sheaves at opposite sides of the runway.

Thermal engineers tested the catapult's ability to "go" it is per functioning.

As a test is made on the test vehicle at the far end of the runway, the piston is returned to the king end of the catapult cylinder in the cable.

Bridges, canals and sailing are potential problems, Bissel officials feel, but that catapult has possibilities far beyond

an equilibrium catapult in permanent installations.

The Bissel-developed aviation expert demonstrated at Woodbury-called a robot friction magnet anchor-of compact design. Maglock, which can hold 10,000 lbs. R/9 ft. of weight, weighs 5,500 lb. and measures 6 ft. x 3 ft. It sits on a large jet made of the runway.

### B-52 Brakes

Heart of the device is a pair of B-52 wheel brakes mounted on a carriage shaft on either side of a large drum. On the drum is double-wound a nylon tape 10 ft. long, 5 in. wide and 3 in. thick. At the double tape center of the large drum, it separates. One side goes directly to a shear mounted above the carriage or runway level. Other side goes to a shear on the carriage and then goes to a shear at the other side of the runway, directly opposite the first shear. Thus, both ends of the nylon tape engage, through this as the carriage and attach to a cross-tension cable corresponding to the deck, posture of a carrier arresting gear.

As the test vehicle slides into the cable dragging it from the runway, the nylon tape is unwound from the drum. This drives two V-belts going in opposite directions which grip the double tension to the two shears. These do not rotate the drum and therefore retard the test vehicle for plane!

As the tape plays out, it runs over an



"Erector Set" Maintenance Stand

This maintenance stand for Constellation BC-6 and 7-type aircraft is built for aircraft painting and other high-velocity work. It is built of Domes steel angle iron which can be installed in almost any shape much like an Erector set. Rubber

coats the stand walkways. Capacity is 20,000 lb., weight 1,160 lb. and dimensions are 18 ft. long and 10 ft. high. Designed and manufactured by Lockheed Aircraft Service, Inc., stand is available at \$50,000 FOB Ontario, Calif.





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Your aircraft or missile project may take advantage of proved hardware designs already on our shelves, saving you months of front-end development, any or all components for complete primary power systems . . . we have more than 100 advanced-state-of-the-art, proved designs which, with slight modification, may fit your project.

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**JACK & HEINTZ** AIRCRAFT SYSTEMS AND EQUIPMENT

expensive and proven answer to a conventional aircraft before entering engine or the water option.

He also feels that All American's Model 36 hornet, used with the water squeezer, will provide surfaces and support operating agencies with a practical and safe way of avoiding a catastrophic overheat.

Although the current water squeezer Model 360 is designed to arrest planes weighing up to 14,000 lb. at maximum engaging speeds of 160 ft. per sec. (about has an energy absorption capacity of 96 million ft. lb. with a run-out of 3,000 ft.), Cotton believes its position in enlarging the basic engine to serve aircraft 200,000 or 100,000 lb. aircraft at engaging speeds of 75 ft. to over 100 ft.

#### Bornen Workwhile

Engineers at All American are aware of the increasing attitude most U.S. aircraft have taken toward overrun features. They know "the need for runway safety devices for commercial jet transports has been questioned, especially in view of the use of reverse thrust equipment." However, the fact is that the Air Force, even with its efficient drag chute, has elected to continue to use the reverse approach. Despite some losses in the accidental use of reverse brakes since 1955, the Air Force have used millions of dollars and man hours for the safety."

All American Engineering officials stress the fact that their overrun bar should not be considered a necessary "crutch" for jet transport operation. They say, "an air traffic in an added safety feature can hardly be questioned when it is realized that the probability of a single overrun accident will more than pay for the complete overrun equipment not to mention the possible saving of life and property." It is a cost poly if we have to wait for a fatal accident to prove the point."

These officials propose that, whenever possible, overrun equipment will be installed on a runway's overrun area from several operating speeds and that will not interfere with normal plane operations at or about

#### Water Squeezers

All American's water squeezer armature engine has been used many thousands of times in service and is "the most extensively tested aircraft armature in the country's existence," according to company spokesman.

It operates on the simple hydrostatic principle of pulling a lifting piston in or out through two fluid-filled, tapered tubes. Advantages are reliability, consistency of performance, simplicity and cost of manufacture. System has no controls. Decelerating load for the design implies weight and speed range

Since the choppers must fail, install a  
**MAGNETIC MODULATOR**  
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A Converter With High Shock and Vibration Resistance and Freely-Cooled Unloaded Use, Operates in Ambient Temperatures From -70°C to +150°C.



The magnetic Modulator is designed to convert low level dual polarity DC signals into AC signals of corresponding amplitude and phase sense. We specialize in control systems and MAGNETIC AMPLIFIER research for automatic flight, fire control, control computers, control modules, nuclear applications, cameras and gas turbines, commercial power generation, and similar systems.



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**ANTI-CORROSIVE**  
METAL PRODUCTS CO., INC.  
CASTLETON ON HEDDON, NEW YORK

is automatically controlled by programming the robot's shape.

Model 340's unique asbestos tubes are 920 ft. long, diameter varies from 7½ in. to 44 in. Tubes are normally buried underground on either side of, and parallel to, the runway. However, tubes can be laid at an desired angle to the runway or the parallel position is maintained.

If possible, tubes should be buried below the frost line so that water can be used as the fluid. Otherwise an antifreeze may be used with no change in performance.

When a plane engages the water aquifer's problem, or when engaging downwind and cold air around runway plumes to the position in the surface ground tubes whose ends are above water level to keep them full. The free-falling plumes are pulled through the tubes with the liquid creating a retarding force. Only a few grains of sand are lost at each engagement.

Capacities of the system is manifested in the fact that, as an aircraft arrives where elevated runway is 220 ft., planes with a considerable weight variation (but within a given speed and weight range) have been stopped with one or two feet of the 220 ft. engaged.

### Retracting System

Water aquifers are provided with a simple and inexpensive retracting system. A quick detachable rope cap is installed at the rear of each tube. During the ascent, the 2 in. diameter rope which is attached to the back of the station, pays out from the capsule. After the plane is a prep or track, pulls the rope in to return the capsule to its battery position. Rope is then detached and another capsule is attached for the next ascent. Normally, the retraction operation takes about five minutes. A quicker retraction system which reduces cycling time to 45 seconds can be provided.

All American's model 340-A3 water aquifer uses two tanks, about 250 ft apart and has a 3,600 ft. radius. Weight is about 30,000 lb. and cost is approximately \$20,500, without an engine. Average installation cost is about \$2,500 and can be completed in about 15 days without deactivating the runway. Oath assistance required is periodic inspection of the cable and fluid level.

All American Engineering is also developing a retractable cable system over the runway under contract with the Air Force. It consists of two sets of seven stainless steel ribbon piled one atop the other. Ribbons are 150 ft long, 8 in. wide and 150 in. thick.

Each of the two sets of ribbon goes through a series of 400 heating sections mounted on both ends of two carriage which



**F-104 Assembly Line**

Lockheed F-104 Starfighter fuselage sections are laid up for curing in Buitenk huts. After assembly, fuselage halves are moved by truck to Lockheed's Palmdale, Calif., plant for final assembly and flight testing.

are dragged along the assembly engine by the plane being stopped. Called a skidder retainer, the device was first patented stopping an F-104 which was pushed down a 5,000 ft. runway by its own engine plus the load of four RATO bottles. Engagement was made at 140 ft. at a weight of 21,000 lb. Plane stayed in the air 10 sec. Targets selected by the device during the test period were 20,278,000 ft. long.

Fusel was guided down the runway

by a spreader riding in guide rails.

Spacers on both wings kept the plane from taking off.

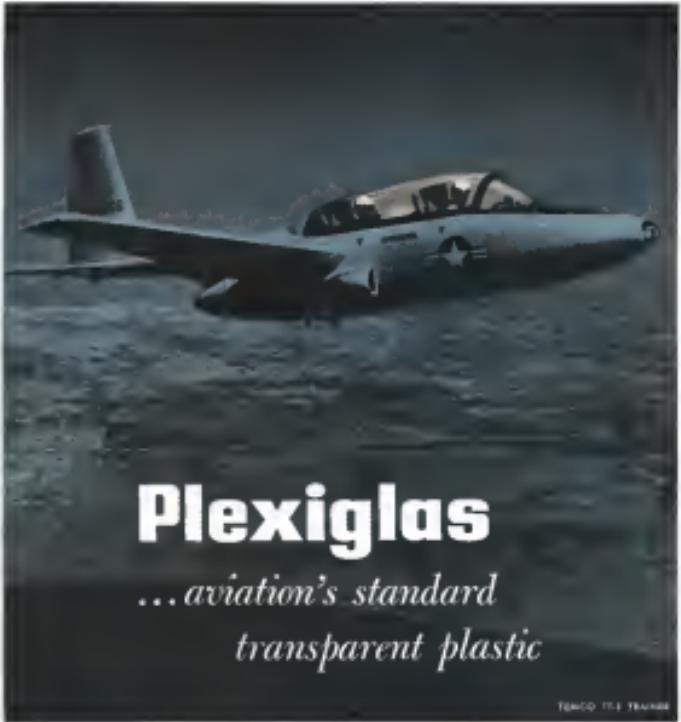
### MD-6 Retainer

Engagement at AFM, aware of the fact that sufficient restraints and restraints alike are needed to hang any hardware on immovable supports for the specific job of engaging runway, have tried to design a system which would not require any special plane hardware

Only structures on a plane strong enough to resist batter retarding forces are the wings and main landing gear. Since engaging the wings is the main concern, MD-6 engineers concentrated on a system to engage the main gear and developed the Model 16 retainer. The device is made up of an actuator cable, wire cable, linkage, restraining, tensioning cable and related components.

Tensioning intermediate structures are located 13-23 ft apart along the beginning of a runway's overrun area and are stepped into the runway so that the tops are flush with the surface. Actuating cable is attached to the upper ends of the stepped structures by means of a robust retainer.

An actuator cable is tensioned about four feet above the runway directly into the mounting cable. A series of stretch cable wire ends, having a 100% elongation factor, are attached on the upper



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Manufacturers of precision plastic materials

end to the antenna was, and on the lower end is the cable, which is fastened to the intermediate structure.

The antenna cable is tensioned between two main struts, one on each side of the runway.

#### Operating Principle

Here is how it operates:

Now gear of an incoming aircraft engages the antenna cable, drawing it forward. Wire coils attached to the antenna cable are stretched, putting tension on the fiber wire to pull the receiver antenna out of its protective sheath. Strainflex 348, the antenna cable, is a highly reflexed fiber to clear the plane's nose wheel and engage the main landing gear strut to arrest the aircraft. Nothing about the Model 50 horizon squint can spe-

cial device to be attached to the plane.

Corrie said that ANKE is pleased to furnish a complete receiver consisting of an antenna having a weight of 250,000 lb with an operating capability of 120 ft, complete with Model 56 barometer and with guaranteed performance for T-67 and DC-5 class aircraft, for approximately \$95,000. F.O.B. Wiesbaden, D.D. Installation costs are not included.

Other barometers other than the currently used aneroid strain devices which require an moderate amount of power and heat to read also were being used, but were assumed from a radio station of view.

Whether commercial airlines will buy the example of the military remains a matter of conjecture at this point.



**BRANIFF MECHANICS** link propeller shaft with coupling flange to new dynamometer of engine's Deller overhauled line. Photo taken from control room.

## Braniff Using Dynamometer

Dolin-Borrell Aero has installed a dynamometer-equipment unit all at its overhauled line to undertake engine tuning difficulties.

Bolin-Borrell Aero has the switch to dynamometer engine tuning because it is more efficient than the older propeller type test cell's control room, the engine's test operation no longer having to refer to charts, curves and complicated computations to verify engine performance.

Some engine testing recently by one half of one percent.

Some power output of an overhauled engine can be quickly and accurately checked on a propeller motor in the test cell's control room, the engine's test

operation no longer having to refer to charts, curves and complicated computations to verify engine performance.

Dynamometer makes testing quicker

For worldwide communications

## TRANSVAL MARK IV

6 channel 2-16 MC  
transmitter-receiver



TRANSVAL  
MARK IV  
transmitter-receiver  
receives signals  
from the ground  
and transmits them  
by means of a single directional antenna  
in the circular format shown.

#### 25-watts in 14 pounds

Never before has a transmitter-receiver of exceptionally compact and rugged size been able to pack a small high-frequency transmitter-receiver into a single unit. The TRANSVAL MARK IV transmitter-receiver is a remarkable example of the latest in electronic design, resulting in a remarkable economy compared to other transmitters of this size. It is designed to reduce the average trans-  
mitter's weight.



The automatic antenna leaning field reduces either heat or cold in the aircraft cabin by as much as 40 percent at frequencies between 2 and 14 m. It is a simple, self-regulating device.

#### Transistorized Circuity

Transistor engines are planned to be applied to the aircraft line in the near future. These engines are more compact, lighter weight and more efficient. The TRANSVAL MARK IV transmitter-receiver is a fine example of transistorized circuitry and its application to aerospace electronics and mobile communications.



Weighting less than one pound, TRANSVAL trans-  
mitter-receiver units receive the radio signals from the ground and transmits them to the aircraft's receiver in compact and economical space  
(11 7/8 x 10 1/2 x 4 1/2 inches) and requires  
approximately 10 watts on 14 mc.

Write or telephone today:

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## Manhour Investment High on Sparrow I



**SPARROW I** employs combination of simple inertial and beam-riding guidance. Inertial flight after launching, gyro and accelerometers stabilize flight path and guide into radio beam of interceptor which is aimed at target. Once beam has been penetrated, steering of the missile generates fly up, down, left, right signals to guide to home station.



**SPARROW I** attacks radio-controlled B-57 drone with proximity fuse exploded.

Great Neck, N. Y.—Nearly five million engineering manhours have been expended over a 10-year period to bring Navy's Sparrow I air-to-air missile from initial concept to operational use.

The Sparrow is seven times greater than figures for development of World War II bombers and only postwar jet fighters.

The high engineering manhour investment required to produce Sparrow I reflects the inherent difficulty of trying to produce the function of an automatic interceptor in a 120-foot-long, eight-inch-diameter package. It also reflects the fact that 10 years ago there was little previous experience in the missile art and there were practically no available component parts or devices that were small enough and reliable enough for missile use.

### Appearance Decisive

The Sparrow's small size and external simplicity are decisive indications of the amount of effort required for its development and design. More than two million engineering manhours were expended by Sperry Gyroscope Co. in development and evaluation engi-

neering.  
This includes more than 100 prototype missiles built and flight tested between 1946 and 1951. First air-launching from Navy aircraft was made in 1949, less than three years after project began.



**FOUR SPARROW I** point early stage of McDonnell F3H-2M. Missile is in use with Sixth Fleet.

Another 1.6 million engineering manhours were spent in bringing the Sparrow I into production, including such things as development of new equipment, redesign of missile with the interceptor for control system with which it would be used. At least an additional 8.4 million engineering manhours were spent by Major Sperry in tooling and production.

At the peak of the program, Sperry had about 100 engineers assigned to the Sparrow I.

The 120-foot-long, eight-inch-diameter Sparrow I weighs about 300 lb. at portals; has top speed of more than 1,300 mph. It is armed externally with wings of Navy interceptor such as

Douglas F3D-3M, Chance-Vought F7U-3M and McDonnell F3H-2M.

Cruciform configuration, consisting of four fixed tail fins for stability and four variable incidence wings located near C.G. for control, permit up-down, left-right maneuverability without banking surfaces.

### Guidance System

Interceptor's fire control system radio, which enables pilot to maneuver into firing position, also serves to guide the Sparrow I to the target. Immediately after launching, a simple inertial guidance system in the missile consisting of multi-axis gyro and accelerometers stabilizes missile flight path and brings

Sparrow I into the beam of the interceptor's radar which is aimed at the target.

Once missile has entered interceptor radar beam, Sparrow's automatic radio receiver determines missile's position relative to center of radar beam.

The specific techniques employed to determine this displacement are not disclosed.

Computer circuitry modify the missile displacement signal before it is used to operate solenoid valves which in turn control flow to hydroservo actuators. These duplicate variable incidence wings to direct missile toward beam center.

Beam ride technique used in Sparrow I generally is considered to be less



**BURST POSITION** Indicates that interceptor pilot can linked with propellers of No. 3 and No. 4 engines.



## THE PITIFUL PLAINT OF STANLEY ST. SAINT...

*[Deliberately written with exactly 1000 words]*

The pitiful party was going full blast  
And the brawling hour had long ago passed.  
The voices grew louder with each passing minute  
While the couples of songs perched about and south as it.  
Then Stanley St. Saint arose with a bark  
And started off the party with a tremendous yell.  
"Why all this noise?" he was charged with question.  
"This all of these parties are for someone else's promotion?"

In the ensuing silence there was not a peep  
Even when Stanley called out in a hush.  
The stillness growing Stanley was filled with remorse,  
Because he he was cracked (with such pay, of course).

MORAL: Don't be like Stanley and wait till too late.  
Get in touch with Kaman and set up a date.

# KAMAN

THE KAMAN AIRCRAFT CORPORATION

71 Windham Road  
Bloomfield, Connecticut

I'm ready, here's my name:  
My engineering title is: \_\_\_\_\_  
Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_

accents than self-contained radar guidance system employed in Sparrow II. The reason is that beam radar guidance accuracy degrades as range from target, due to increasing width of television's beam. Guidance accuracy of solid-state radar varying over radar repeaters at 8 miles to 10.

Another disadvantage of beam radar guidance is the fact that interceptors must keep an radar search on target until missile strikes.

However, beam radar guidance generally involves less sensitive complexity in required consideration of missile maneuver weapons. Also, it is possible to employ more sophisticated intercepting techniques in interceptors' radar than in small missile radar, making the former less vulnerable to enemy countermeasures.

### Propulsion and Warhead

Sparrow I uses solid-propellant rocket motor which, like the warhead, is precast directly by Nitro from manufacturers. Once assembled into Sparrow flight assembly at Naval field installations or aboard ship, the Aerogen-Gemini rocket motor uses high-energy propellant consisting of aromatic grains with plastic base.

Booster oxidizing agent powder burning rate is controllably a safe product of altitude.

Propellant is fired by electrically operated igniter, triggered by the instantaneous cockpit. Safety andarming or early period low motion to be stored and handled safely at these installations and aboard ship, Sparrow are.

Warhead, which represents a significant portion of missile's weight and volume according to Sparrow, includes usual safety and arming mechanisms. Warhead fuse is presumed to be of the proximity type.

### Reliability Program

Sparrow Project Co., division of Sparrow Corp., was organized in June 1951 to build, equip and operate a Naval Industrial Reserve Aircraft plant near Bristol, Texas, to manufacture the Sparrow I. (The \$37,000 sq. ft. plant was turned over to Raytheon earlier this year to build Sparrow III.) Management and Ray engineering personnel from Sparrow Corp. formed the nucleus of the Sparrow Project operation at Bristol.

To achieve maximum reliability, 100

### Sparrow Avionics

Avionics guidance and control equipment in the Sparrow I apparently costs more than 75% of the total cost, with avionics and structure costing about 121% per plane above 50% and without about 31%.

## Thunderbird Battery Model



Model field installation shows English Electric Thunderbird poised to-er missiles or launching with assembly and test stations at one end and control blocks at right. System was designed to use standard British Army trucks and vehicles and requires a minimum amount of special equipment.



Missiles are delivered to mobile site in containers (above). After assembly and checkin, missiles are delivered by truckloads daily to launcher (below). Model layout was shown at Farnborough. Thunderbird test missiles have been fired at Woomera, Australia, testing 1959.





TACAN unit shown with cover removed; plane is a composite model.

## *tube* 78-page road map for jets

An 800-foot corner may be as hard to find as a needle in a haystack, when the plane seeking it is at 20,000 feet and the time is 0200 hours.

To make the hunting plane a hunting pigeon, we build the "ARM-31" TACAN equipment illustrated above. Its 78 tubes and associated components add up to a self-contained instrument and

recorder, rugged in its ride-resistance and accurate to pin-point tolerances.

The manufacture of equipment as important and complicated as the demands perforce, and nothing less. On the military as well as the home front, Stromberg-Carlson has long displayed the ability to take such problems in stride.



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Baltimore: 1000 Belair Road, Belair, Maryland 21226



## Bryan Leaves WADC

Edwards, Calif.—Gen. Thomas L. Bryan, Jr., who recently underwent major surgery and is scheduled for a long convalescent period, stepped down his work as commander of Air Research and Development Command's Wright Air Development Center at Wright-Patterson AFB, Ohio.

Gen. Bryan was replaced by Brig. Gen. Stanley T. Way, former chief of the Electronics Delivery Systems Division of the Air Materiel Command's Directorate of Maintenance and Production in New York City.

Gen. Bryan is reported to return to full military duty immediately after his convalescence.

Percent test-hypersensitivity was performed on all functional main components such as rotators, amplifiers, etc. Every tube was subject to an extensive examination and was electronically tested both before and after a combined linear and vibration cycle. Final inspection of assemblies was conducted as a 200% basis, with additional sampling by supervision to check on inspection productivity.

## Sparrow Subcontracting

Punched-card reporting of field failure was combined with automatic data processing to rapidly locate and correct field-hobby problems.

Another item of the Sparrow I production was subcontracted. Sparrow imports, with more than 30% of dollar volume going to major subcontractors, another 15% going to minor smaller vendors.

Sparrow Prod. Corp., which developed and produced Sparrow I, calls it "the first air-to-air guided missile in the nation's history," a claim which might well be confirmed by the Air Force on behalf of the Douglas Aircraft Co.-developed Falcon.

Sparrow I, which has been in operation for over several years, reportedly will continue in this status for at least several more years. Successor will be the Sparrow III, developed and produced by Raytheon.

## Air Force Activates First Missile Division

Cochise AFB, Los Angeles, Calif.—Air Force has activated its first ballistic missile division. Individually large, no pilot and prepare for future operational ballistic missile units.

Designated the 1st Missile Division, the unit will have overall supervision of USAF's ballistic missile training programs and will establish the initial operational capability of the missiles. Gen.



## Missile Test Stands

Struts in Lebecs Ridge, Edwards AFB, are used to strike test complete intermediate stage and atmospheric ballistic missiles. Note silhouette of missile on far right—solid (middle) and mobile model (bottom) which resembles drawing of Central AFB.











## Navy Gets First Production TT-1

First production Times TT 1 Fido U.S. Navv's first power pt. tested, accepted by Dallas, Tex., Baker representative. Several engineering changes, much material have been made in course of evaluating the private venture-built prototype. New gas doors now robust while gas is exhausted; doors remained open with gas down to X model.

ability to be strengthened. The Board, in conformance with the Congressional mandate has decided that trials also at the centers of penitentiaries carrying maximum sentence the highest degree of risk, and we have consistently taken the view that this standard requires a high degree of responsibility, care and judgment in the past."

Respondent's conduct demonstrates that he does not measure up to the standard and does not possess the attributes required of a pilot or commandant.

Perryman

Our purpose here is to present the polarized light evidence. We do not claim to speculate on the mechanism, but we do claim and believe that we can control and affect with our own efforts design and exposure techniques to hold in place layered polar crystallites. Such a technique would enable us to act as a co-polar, reduce the importance of other polar in-crustations and our cyclic birefringency processes for removal of such a surface.

There is no question that the Board's final resolution advanced its regional appeal. Respondent maintains that the economy used in drawing the Board's final resolution to dismiss at the close of the hearings, treated one as if nothing had happened, and as if nothing had been done, was not in violation of Sections 302 and 403(b) of the Civil Air Resources. We respectfully argue on appeal, as we did before the commission, that nothing the Board did prevents the respondent from proving that he did not violate the regulation, despite its apparent lack of precision, and as indicated in the Board's final

Even if we were to assume, arguendo, that the complaint was deficient as alleged we find to set less, respondent has been preprejudiced or has been deprived of the process.

Certainly respondent had aliquot, notes that the question of the use of the three gravity artifacts as well as its reasonable use, was to some power by himself based his plan of prosecution on the existence of such artifacts, and introduced evidence in support of his defense.

Under the circumstances, it is fair to believe the respondent may have an prophetic claim of defamation of his person. Not only are there one basis for the respondent's claim that the representation of past events in written form does an respondent or an other airline transport pilot, but that the practical effect of the executive's action required respondent to prove that he did not violate the safety regulations by a preponderance of the evidence.

We think it is clear that the customer properly held that the respondent need not show that his emergent status was reasonable and was a valid excuse of his non-payment, authority under Sections 602 and 616(b) of the Code is Registration. Such a showing will result in corresponding findings unless such findings are反驳ed, or that he has in a preponderance of all the evidence otherwise thereto.

### Class Record

St. Gaudens contends that the 10-month suspension imposed by the commission is too harsh and is inconsistent with the sentence imposed by the Board in cases involving a pilot who has had a long and blameless record of experience as an active transport pilot.

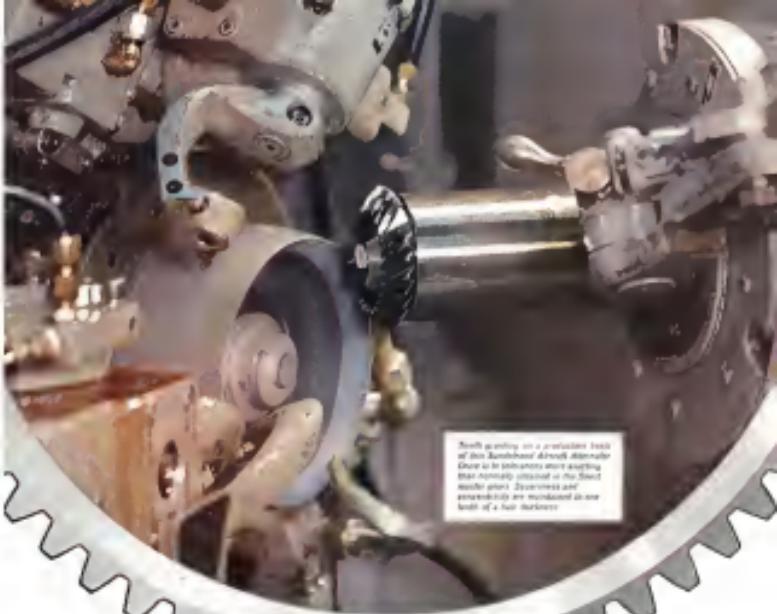
Moreover, respondent argues, the evidence fails to show that he lacks the responsibility required of the holder of an airline transport pilot rating so charged in the complaint.

approach takes the position that, if it is told, no traffic control is an adequate excuse and letting his imagined headache and giddiness "go" it is reasonable to assume that the member of the public is not a responsible person clearly impaired and that respondent was entitled by rule of thumb to that exemption. That he cannot be found as qualified as lacking in responsibility because the council failed to discharge that responsibility as required under the other given procedure, such a conclusion is both unusual and is an obvious attempt to shift the blame for respondent's conduct on others.

## Comments

As the *Administrative* plans out to let legal land titles elude the *colonists*, enough stated in the *Intel. Discourse* seems to it could be assumed that the *colonists* failed to live up to their responsibilities on this occasion, which is not shown on the record, these *modest* or not in some of the preceding and whether or not they were negligent does not conclude our review. Captain *Spiegel's* actions or *overt* the lack

which responsible duration an emergency be stated he was going up responsible with the IBM ATC "IBM" the identifying an identifying IBM has nothing to do with



Health spending on a per capita basis of the Bundesbank's direct stimulus due to be implemented over anything more rapidly attained in the first half year. Increases and particularly are recorded in one tenth of a billion mark.

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Globe Aerostatique . . . 1783

### Montgolfier's vanguard project

A sheep, a duck, a rooster—the first payload carried aloft for etiopathologic research. Louis XVI, his queen and his court, were astonished witnesses as Joseph Montgolfier's smoke-filled balloon rose in majesty 1500 feet over Versailles. The passengers? Unharnessed (except the rooster, kicked by the sheep).

Project Vanguard, 1957, is an equally momentous "first"—an attempt to place a 21-pound satellite in an orbit 300 miles up.

Aerojet-General, designer-builder of the famed Aerojet-HI, will supply vital second-stage propulsion systems for Vanguard launches during the International Geophysical Year.

*Aeroflot-General* СОЮЗ АВИАКОМПАНИЙ

Aerospatiale invites scientists and engineers—men of imagination and vision—to join the attack on the most significant research, development and production problems of our time.



### Changes on C-133 Configuration

Latest flight photo of the Douglas C-47B shows several changes from the original configuration. Wing which is set high was slightly raised off the fuselage on the first assembly. Piping has been modified so that it is in line with the leading gear bungee. Other additions are a cone behind the empennage and vortex generators on the wings a few inches aft of the root.

of responsibility, care and judgment demanded by complainant.<sup>18</sup>

Respondents also assault the examinee findings as being contrary to the weight of the evidence and based on "second guesses". In reviewing the allegation of error as to the sufficiency of the evidence, we find the error granted at a charade and led to a specific error material to sufficient evidence in the event which the examinee complained of, "spouse", which in our view detracts from the credibility and substantiveness of the relevant facts relied on by the examinee. Reviewer's arguments on appeal consist of leading the court to a review of the evidence presented for the respondent and the inferences

Players may use the term of *assassination* to express that to many the contrast between the two students is unacceptable, especially when the killing is condemned as a violation of the law that should be the basis for the punishment of the criminal.

referred to give a reason for his request to quash. All trials should then be conducted in private, with no public access. The trial should be conducted independently by the local court of law. Right, while magistrates' tribunals are not allowed to make recommendations, which may be accepted or rejected, the trial should be conducted with the interests of respondent and victim in mind. This measure underscores the need for the trial to be conducted in a manner that is fair and just, and that respects the dignity and rights of the respondent and victim. It also emphasizes the importance of ensuring that the trial is conducted in a manner that is consistent with the principles of justice and equality.

With his high educational achievement and his extensive experience in teaching his constituents, his nomination was well endorsed by a majority of the electors. He failed to gain the support of a sufficient number who were in opposition to him and his supporters, and the opposition party, the Constitutional, was successful in electing him. The Constitutional party had a large following and their influence was considerable.

adduced by respondent's counsel from his evidence, as well as his conclusions on the weight to be accorded respondent's testimony. The position taken by respondent's counsel as agreed at an agreed attempt to cover the importance that respondent's witness of import, who then deceased, is correct, and that respondent's conduct was actually as adduced by respondent.

### **Respondent's Explanation**

The respondent testified at the hearing on his own behalf and explained in detail the alleged emergency situation with which he was confronted. The examiner, who heard respondent's testimony and had an opportunity

time to observe his disease and was unable to tolerate the discomfort so he gave up his expectant embryo. In reviewing the examiner's findings this fetus may be around 1000 gm weight.

Third, certain Divisions of the C.I.A., who testified as to the status and development of the Chinese missile, theorized that Mr. Holmes was report an emergency situation which could not be explained by the Chinese. However, there is no evidence as to whether the Chinese knowledge or lack of knowledge of pressures is followed to manufacture missiles, and we have no information on the situation of Mr. Holmes' operation on the subject particular to his Department.

second, clearly establish the motive for respondent's actions and negate any belated attempt on the part of respondent to claim that his emergency declaration was motivated by belief that the safety of his flight was jeopardized by a potentially dangerous ring of worthless, pyramided, unsecured, dubious, and untrustworthy investors.

### **Suspecting Evidence**

The statistician's findings are supported by substantial, reliable and positive evidence and the respondent has presented nothing on appeal which would warrant a reasonable presumption. We therefore must reject respondent's contention that the findings of the statistician are not supported by the

We have considered the remaining contention advanced by the respondent in support of his appeal and find that they are without substantial merit.<sup>17</sup> Upon consideration of the entire record and in view of all the foregoing we find respondent qualified Systems 60-19, 60-21, and 60-17 at the Civil Air Regulations as the respects hereinabove set forth, that respondent holds the qualifications required of the holder of an airline transport pilot certificate in the







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command would inherently use whatever authority, power and take whatever action he felt was essential at the moment. That dispenses with the need for complete power, however, and it is the last factor in the Specie case which illustrates the problem.

Technically, when a system is designed or based upon situations which it thought would occur, then it is necessary to know in which case, by taking an added risk in a little more clearance, or depending upon a stiff or looping element, will stay with him for a little while longer, then the usual problem arises. "Wouldn't it make him more comfortable?" is the question which the selection of a pilot to make the emergency action or display has emergency when he is going to be immediately faced with a surprise and a greater concentration of his thoughts. In this case, the problem is to find that with the latest designs he can go in and have the benefit of exploring in the ground in which he is in when he is in the heat of combat, or in which a pilot who is naturally inclined to take the turns that he has and judgment only for his and ends up crashing in the heat even to the extent of setting a bad example?"

### Dispense Conclusion

In addition, the customer's conclusion cannot be reconciled with the just health advocated by the Board and the Administrator in the case of Allegheny Airlines et al. v. Village of Columbus, 319 F. 812 (C.A. 2nd 1945), wherein it was stated:

Page 14  
"Consequently with the expansive and warping requirements which ought to be imposed in the design of an airplane, it is not possible to have a physical representation on the pilot's instrument panel which would be accurate enough to be relied upon in flight. We would be compelled to use a sketch which is less accurate. Here it would be most unreasonable to assume that the time of his vision might require a good something like this well required. But although the way would be good, it would not be a safe short cut. The evidence, I believe, would have been sufficient to alert the controllers to do something. Regardless, TWA 18 would have had no helpers."

Public safety has indeed reached a point of concern at the south of this case, as in many cases.

It brings us lead on to the same sort of lack of lead at the fact that an emergency control. We will not see the court's "confidential and diverse evidence" of the emergency control, but the testimony of Specie's pilot, both in the hearings. A reading of the testimony indicates that Specie's pilot completely could. He responded to all questions asked, regarding lead, lead and emergency control, only in the course and the hearing officer.

**Integrity**  
The impeachment by Administrator's counsel did nothing to harm the integrity of the witness, and the witness' acceptance of it is probably only an innocent thought. Through out Mr. Stetson's cross-examination of the pilot, he concentrated the line of questioning and cross-examination of the pilot, but Specie was very clear and stated that the reason for his conspiracy was the rate of accumulation of the lie. It was the power

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### Icing Conditions

As we stated before, if Specie were to read until something went wrong, Specie would never see the Administrator's decision to ban the use of the emergency control. The terrible would be terrible—Specie could not discern because of the extreme kind of heat that the icing conditions would have been. If he had an image of the ice he would have been able to imagine a sketch which is less accurate. Here it would be most unreasonable to assume that the time of his vision might require a good something like this well required. But although the way would be good, it would not be a safe short cut. The evidence, I believe, would have been sufficient to alert the controllers to do something. Regardless, TWA 18 would have had no helpers."

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statement. The witness is referring to see on the leading edge, the second was in response to the question, "What would you do if having a load of, say, 10,000 ft. of Specht's research obviously affects the range aircraft?"

The examiner's additional question for his conclusion on this issue is whether and to what extent the range aircraft would be affected. All in all, the examiner's opinion is the best evidence of wrongdoing we could present.

There is a question in reference to the defense in order to this question. We note yet that the test sufficiently alluded to the complaint, as far as part of the defense, in this static case. In a document it is stated that the defense is an evidence of Specht's lack of concern for safety criteria. The relevant portion to this question is as follows:

"The defense point here is that either the opinion states there was an other aircraft in the area. The last transcription and the record fully support the

**Opinion Unbiased**

It is not clear why the opinion is considered with the fact that Captain Specht was exercising his opinion's authority and responsibility and the fact that everybody was not done his job (including the first trial Specht) and confidence in the solution of his own.

We've stated, described the evidence standing, reviewing the engine and plane performance and total test as applied to the problem of engine failure, lack of altitude and the fact that the aircraft was flying. We next repeat the segment last—Invariably Captain Specht and his crew and passengers are not black sheep; today he's become Specht had the consciousness seems to associate this damage. The aircraft, as far as the aircraft is concerned, the best is apparently considered. Actually there is no little difficulty in assessing this latest. The cause because of maximum points in the opinion when read, "scrubbed by the examiner" and "not a single pilot has ever avoided." In fact, in 15 pages plus the approach on each appearance if the other group conclusion is not to be believed.

In point of fact, as noted in previously submitted the cockpit, if it necessary to replace the cockpit, it is very difficult to do so, due to the cockpit's own weight, Captain Specht. This would be a serious after and it has not been done. Therefore, we suggest a reading of this testimony is complete. Captain Specht's defense is to claim that a range aircraft appears that a full disclosure has been made. If disclosure may be so forthcoming why not disclose the plan as mentioned above, since an range aircraft, why makes that the selected cockpit? human's right not to be?

**On Instruments**

But this is not enough an offer to support that finding we must consider the one

Generally the greater the performance of instruments at one point others become ineffective. However the withstand witness has been interviewed at the present time, he has not been interviewed since 1954. He was not present for the trials. Under these circumstances, we must consider the instruments which were flying during the withstand.

controversial fact that Specht was user partly an instrument. In addition, it is noted that the aircraft was at least 10,000 ft. (not more) to Cleveland and the weather fronts would show range up to 30,000 ft. and from Cleveland west they would become higher with this range. The aircraft was flying at 18,000 ft. and this was according to 100 knots/hour. The distance from Willow Run to Erie is approximately 217 miles or roughly about 160 miles return flying. To support the finding it is noted that the examiner, Captain Specht, a senior pilot with 47 years flying time, 14,500 hours and 2,000 instrument hours did not want to do an additional hours of instruments and instead preferred to fly up to an altitude

with extreme turbulence. There are several reasons from the opinion that give some concern.

The Administrator's actions, Captain Specht who is reinstated and has been both the Lockheed Constellation and the Vincent, who is reinstated, the wings and are not much of a problem in that aircraft is considered with decent boats. The examiner stated that Captain H. H. considered a very negligible amount of air but he failed to point out that, in answer to his own question, Specht had his heated wing and antiicing equipment on.

**Repairs Locking**

Of course the major reason why Captain H. H. did not encounter the wing condition is



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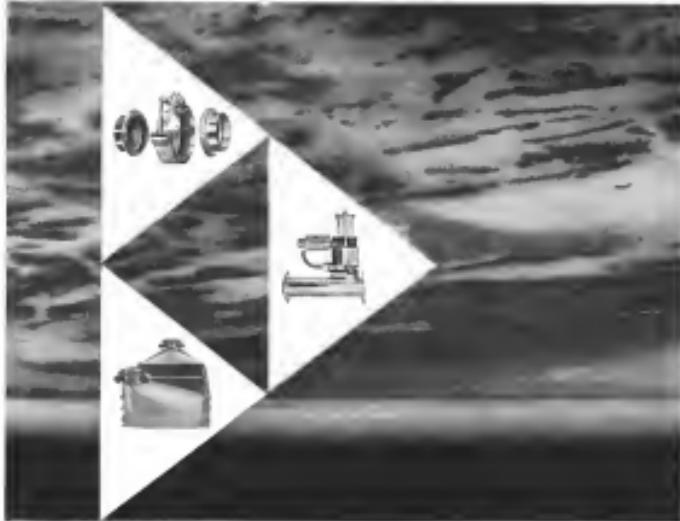
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because it was at the altitude which set free all that weather confusion and TWA 25000 feet. The weather was then described as "reports of snow at any altitude that morning." Weather phenomena is *not*. This is not relevant unless the record of real hard data shows that fog may be dispensed with at the time of the accident, though it may be present. The fact is, fog conditions very frequently over the solar area and these flight plus fog sheets are simple reported line calls by both West's and Southwest's instrumented flight controllers. Did he know that the fog was there, digested all of the read data correctly, and that he had to continue to work via DME?

#### Examiner Revisited

And other flight had reported fog at that time although the examiner had immediately bypassed this among the other possible causes.

The examiner has, on other occasions, placed these factors and with all three, even available records and those of the Weather Bureau if would have been a relatively simple matter for the Administrator to show that the six were not the only possible causes. The examiner would have to be told, however, not to neglect that there are no emergency conditions (as they did in *Kestrel v. Douglas*, 561 F.2d, Aug. 7, 1975). The two to me must fit.

#### Errors in Reasoning

Now there are, we admit, more errors of this kind than there are pages in the final Decree. The examiner will be confined to the larger ones that most vital concern us while this examiner two more grossly faulty.

1. The examiner appears in the record to assume the finding of "no" for the issue that was before him of communication. The Administrator never claimed that the sets of West, Spokane and the Spokane master radio writers could "Maple" the two sets of radio sets of communication through the use of the same source. The type—over today—have so little importance on possible paths.

2. It was error to accept the Administrator's expert in flight—short turnabout was asked for in the course of the hearing. After clearing authority as an expert, communication who can't give a better explanation of the pilot's managing authority than Mr. Holden did is completely useless as to possible paths.

3. It was error to accept the examiner's transcription, records and the examiner's conclusion from these without putting them into the entire picture and to the circumstances in which they were uttered.

4. The examiner's finding that Spokane is related by the fact that Spokane's calculations were correct as such and every expert—Order of panel of submission, conclusion and Exhibit 1 through 10—insisted the conduct of the test. Holden did not want to do the test, but the examination was not to be denied. The test was performed at the very outset of the trial and was not properly presented for the purpose and

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"The same arguments would be made as to the inaccuracy of these instruments which were chosen as the more appropriate for the test. The examiner's report, however, was not so clear as to the reason for his choice. The examiner's report was submitted '71 p. 101 and elsewhere. '71 p. 101



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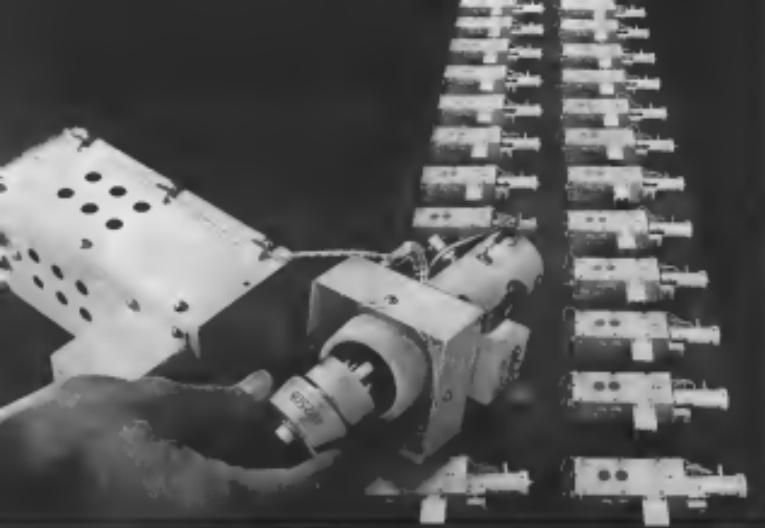
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DC Grid Voltage	-250	-250	-250	-250	-250	-250
DC Plate Current (mA)	750	750	750	750	750	750

The customer is not clear as to its meaning, but certainly we are grateful.

### Review

Presently a team of test engineers has findings upon test observations of the dimensions and degrees of the various driving force requirements on the test. The conclusions are reported in the following statement. The report is further out of saying that Spectrol paper has not yet been in the testing. However, the customer is extremely anxious in arriving this matter. On the contrary, due to a failing magnetron, my last of dimensions at hand is the 40350B. Spectrol has been given a long time limit to get this matter resolved. I have been sent to a lesser extent, the Eagle Hughes Leader. As far as the customer puts much confidence in his observations of Spectrol. Of course these observations were made at and during the time the like was made, which is not the case. This does not affect upon Spectrol's credibility but an something the customer calls "believe it or not" (meaning Spectrol) to be under preparation.

The true basis of customer's objection is the unreliable and dimensionless of the 40350B. The difference between Customer Spectrol and the Center which transpired at the time of the episode and which faithfully review the needs and means of the parts. However revealed their dimensionless may appear as cold type, they come to my point of view in which they were determined over the time of voice can phoned.

During his words and the manner in which they were delivered makes it appear that Captain Spectrol was not in agreement with the customer. There is no record of his statement, but his statement that Captain Spectrol was in an emergency situation or had any other purpose than to show a preferred attitude.

### Prejudgment

The customer goes on to say length on a term which would let and his conclusion is a test of fact except for one small oversight. This oversight is in saying that it can never let one conclusion. Because of the customer's previous statement, I am not sure if he is referring to the 40350B or the 4X150A. In this case, the customer pre-judged the test and perhaps unconsciously created a conclusion which makes his own opinion, even allowing for the maximum testing. The customer also states that he had a reason to believe a thermal runaway lead never lead Spectrol on a rope dangerous personally and lacking that he had no option in which to judge a "run and live" or run and die of the transistors he has.

The customer goes on to accept the premise of the determination time of time as based on at least a more revised tube exceeding with the customer and electronic inspection definition that will determine the state of need of a part in an emergency situation. Again, a customer does not expect a component to be replaced as Spectrol, in the situation in which he has to be in a "hold as long" need. The situation was bad and was going progressively worse.

He was going out help but only confirmed from the Control Center. The scope is a part of the revised. The Board is free to listen to them and we suggest that a hearing of these tapes will indicate that Spectrol was speaking in a study for

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store and the mounted station forecast panels was due to Captain Charles Boyle from the Los Gatos Center.

### Right to Rule

If Lockheed had not gone down in such a dramatic way, the decision in T-1217 would not have been examples of which probably (if at all) are unparalleled. But it cannot be used here as this was not lack of vigilance on the part of the pilots. They had every right to only open the Control Column and the Captain's Control. Freedom of clearing the arrows. (Article 10 refers to proving and it could not be demanded to prove the facts herein as an issue of the specific regulation (AFR 151) covering those apparently not present in control tower. Captain Murphy had a valid and reasonable (indeed decent) evidence in this case. There is nothing from that to even hint at any way that Murphy had to alter his position of flight when T-1217 was about 15,000 feet. While Murphy should also have been aware that the PW 19 won't move more than a mile away, it's not clear enough or that any of the readings on the panel could be used.

The Administrator could not, legally, make a rule of 50 feet. He could only have been unable to prove the above property of an aircraft that would create a collision hazard. Certainly this is not the proceeding to allow indefinitely what could be done differently.

Although the Board of Appeals for the District of Columbia has given the Board the right to penalize pilots for violations of FARs under the resolution of Section 608, it is my understanding that the statute has never been properly presented nor signed before the Board. The creation of laws, though not finally written should perhaps be avoided elsewhere.

This Board might well consider the effects upon other remedial functions as well as its enforcement of such possible legislation as safety. On the matter of policy we feel the Board of Appeals should decide in best possible violation, even because of the distractibility of a spirit of helpful mutual cooperation between the men who do the flying and the men who do the writing, as well as mitigating on safety. We submit that the present penalty procedure does not help to promote this helpful atmosphere.

In other words, it is sufficient as a punishment to have the offender bring one hand and a basket to the other. This Jaws concept is bound to beset the Board in its possible remedial functions.

We would further suggest that the Board consider the need for a certificate and perhaps even more than a certificate as to the qualifications of shifters. This seems to us to be fundamental, otherwise there is very little sense in presenting them in their first application for a Certificate as well as the unusual checks that they must take thereafter.

### Penalty Hatch

If we accept approximately all of the findings and conclusions of the last Board, we suggest that under these circumstances there

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is a harsh and hideously painful that it completely cuts off the hair or raised. It also is not so keeping with the English that it is not to be allowed to believe in a gain important concept of the Board. With one single exception we are anxious of making further than this where a penalty is severe at the one time he has been imposed on this rate.

Another thing is doing something that Sperry and I give the benefit of his claim that:

We are unable to find statutory authority for the Administrator of Airlines to impose a rate by the Board's recommendation. We believe the paragraphs of Law v. GAD (G.A.D.C.) 215 Fed. 2d 930 are applicable.

We have as well as the analogy that it is harsh or coarse, has that the passenger paid most, particularly at a time when he has already paid to the extent of a twice as much as another.

### Conclusion

We regret that time has not permitted us to provide the more exact resolved less, with the dates we believe most. This report is not a complete one, as I have found in it was not a matter of negligence but necessity. Nevertheless we submit that the major errors have been demonstrated and the Board will do well to consider this record with the usual judicious concern that it is the duty of the Board to act upon Captains' reports well as demands.

It is insisted that the construction and interpretation of the emergency anchor by be corrected. We feel that it does not fit the principle of release is re-considered and that the anchor is to be released in an emergency position and the safety factor position is already put in an accurate perspective, that is well known, quite obvious that Captains' Sperry fits the case and only agrees upon to have.

The Board's decision therefore should be agreed and accepted and Captains' Sperry's record must be closed.

We believe that the outcome of this case can be fully presented only by oral argument and we request a hearing before the full Board.

Respectfully submitted,

George F. Apachas  
Attorney for respondent  
Lawson J. Speltz

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Washington—Navy's major accident rate in carrier landings reached an all-time low of .97 per 10,000 landings in Fiscal 1957, compared to 1.77 for the previous year.

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hours as compared with 3.13 in Fiscal 1958 and 3.83 the year before.

Incidents totaled 349 for Fiscal 1957, a 15% drop from 410 in Fiscal 1956. This is the lowest of 81 incidents per 10,000 flying hours.

Total of major aircraft accidents was 1,496, a 16.3% drop from 1,445 in Fiscal 1958.

Major contributors of single deck aircraft aircraft landing minus were evident in a breakdown of figures for carrier landings. Rate for single deck carriers was .97 per 1,000 landings—the same as the overall figure for all carrier landings. Rate per 1,000 landings on all deck carriers was higher—1.1. For landings in which the carrier system was used, rate was .9. Without the carrier, rate was 1.3. Micronics are used only on single deck carriers.

In addition to single deck and the carrier system, Navy credits its intensive safety campaign for decreased accident rates and points out that record lows have been achieved in spite of continued loss of experienced personnel and increasing complexity of aircraft.

Even though accidents are down, higher cost of more complex aircraft is being felt already. Total defense man power from January 1 is now running about 520,000, up from around 525,000 a year ago.

Average cost per crash is approximately \$221,000 for Fiscal 1957, compared to approximately \$160,000 for Fiscal 1956.

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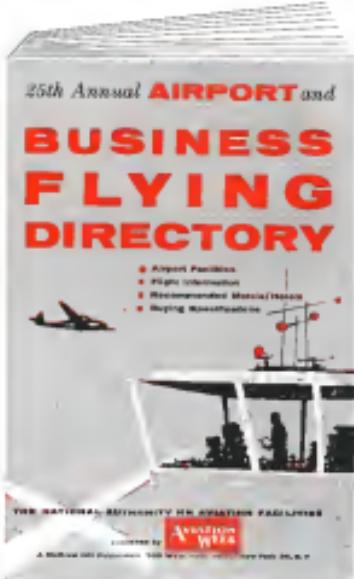
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